PILOT'S OPERATING HANDBOOK

AND

CIVIL AVIATION AUTHORITY OF NEW ZEALAND

APPROVED FLIGHT MANUAL AIR 2825

FOR THE

PAC 750XL

Manufacturer's Serial No:

Registration:

Type Certificate No: A-14

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE CIVIL AVIATION AUTHORITY OF NEW ZEALAND AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER, AND CONSTITUTES THE CIVIL AVIATION AUTHORITY OF NEW ZEALAND APPROVED AIRPLANE FLIGHT MANUAL. THIS MANUAL ALSO CONSTITUTES THE FAA APPROVED FLIGHT MANUAL FOR UNITED STATES OF AMERICA OPERATIONS IN ACCORDANCE WITH FAR 21.29 AND EASA APPROVED FLIGHT MANUAL.

Civil Aviation Authority of New Zealand approved in the Normal Category based on FAR 23. This document must be carried in the airplane at all times.

This handbook meets GAMA Specification N.1, Specification for Pilot's Operating Handbook, issued 15 February 1975 and revised 18 October 1996.

Approved by: **CIVIL AVIATION AUTHORITY OF NEW ZEALAND**

By: ____________________ AWE 3
(NAME) (TITLE)

Date: 22 NOV 2007

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LOG OF REVISIONS

Revision Number and Date	Revised Pages	Description of Revision
Reissue	Numerous	Entire handbook reissued 1 December 2003
1 – 1 March 2004	3-3,3-4, 3-7, 3-10	Rename "Fuel Pump" to "Fuel Switch"
	3-13, 3-14	Revised Engine Driven Fuel Pump and Low Fuel Level Light Illuminates Procedures
	3-15	Low Oil Pressure and Generator Failure checks moved from page 3-14
	3-16	Elevator Trim Runaway checks moved from page 3-15
	3-18	Delete "9" psi insert "6" psi.
	3-22	Additional information on Fuel Systems Malfunctions.
	3-23	Generator Failure checks moved from page 3-22
	3-24	Inadvertent Flight Into Icing and Snow Conditions Warnings moved from page 3-23
	4-10	Rename "Fuel Pump" to "Fuel Switch"
	4-12, 4-13	Additional Note for flight above 16,000 ft
	4-14	Normal Landing checks moved from page 4-13
	4-15	Shutdown checks moved from page 4-14
	4-16	Post-flight, ELT, Environmental Systems and Oxygen checks moved from page 4-15
	4-17	Part of Noise Characteristics moved from page 4-16
	4-18 – 4-26	Page numbering changed, no change to contents
	7-5	Delete "9" psi insert "6" psi.
	7-60	Delete " red" insert "amber" for colour of low fuel pressure warning light
	7-60	Delete "2 $\pm$ 10%" insert "6" psi.
	7-61	Rename "Fuel Pump" to "Auxiliary Fuel Pump"
	7-61	Delete " red" insert "amber" for colour of low fuel pressure warning light.
	7-61	Delete "2 $\pm$ 10%" insert "6" psi.
	7-67	Change "INST LIGHTS" switch from Bus No 2 to Bus No 1

Revision Number and Date	Revised Pages	Description of Revision
2 – 1 August 2004	1-4	Amend oil manufacturer name from Exxon to BP. Add Turbonycoil 600.
	2-4	Amend oil manufacturer name from Exxon to BP. Add Turbonycoil 600.
	2-6	Add yellow light range for oil pressure indicator
	3-3, 3-4, 3-5	Amend Starter Assist Airstart procedures
	4-11	Normal Takeoff checklist item Pitot Heat amended
	4-11	Normal Takeoff checklist item, Apply Foot Brakes and Hold moved
	4-11	Normal Takeoff checklist item Governor Overspeed amended
	5-22	Amended fuel flow figures for 20,000 ft cruise table
	7-37	Amended CAUTION to amplify fuel flow K Factor explanation
	7-57	Amended governor overspeed test
	7-75	Added windscreen demist operation
	8-9	Amend oil manufacturer name from Exxon to BP. Add Turbonycoil 600.
3- 4 April 2006	Introduction i	Addition of EASA
	1-1	Addition of EASA
	2-1	Expanded explanation
	2-2	Inclusion of V_O
	2-5	Addition of Engine Control Operating Limits
	2-10	Deleted maximum demonstrated crosswind, remains in Section 4
	2-11	Amendment to placards
	3-4	Deleted "Preferred Procedure"
	3-6	Expanded caution
	4-16	Inclusion of ICAO noise standards

Revision Number and Date	Revised Pages	Description of Revision
4-20 April 2006	1-1	Change bars on the right not the left
	1-2	Revised turning radius
	1-5	Celsius to Fahrenheit conversion corrected
	1-6	Nose-wheel steering range angles corrected
	2-1	IFR operations added. Required Equipment list layout changed
	2-5	Celsius to Fahrenheit conversion corrected
	2-7	Fuel indicator markings amended
	2-10	Celsius to Fahrenheit conversion corrected
		Cold day limit amended
	2-11	Floor loadings for different serial numbers
	2-12	Oxygen system removed, placards changed to include IFR, icing amended
	2-16	Floor loadings for different serial numbers
	2-17	Oil type placard amended
	3-3	Airspeed range added,
		Switch position label changed to reflect alternative label
	3-4, 3-5, 3-6, 3-7, 3-8, 3-9, 3-10, 3-11, 3-16, 3-17	Checklist actions rearranged and additional switches added, alternative switch labels added
	3-13	Transponder squawk frequency removed
	3-14	Transponder squawk frequency removed
	3-15	Spelling error corrected
	3-16	Switch position label changed to reflect alternative label
	3-17	Actions amended to be unambiguous.
	3-18	Battery failure checklist added
		Cargo door actions amended
	3-19	Spin recovery actions amended
	3-20	New warning and caution lights added
	3-25	Alternative switch position label added
	3-26	Battery failure added
	3-27	Inadvertent Flight Into Icing procedures changed, alternative switch labels added
	4-2	Removed oxygen system
	4-3	Fuel cap warning added
		Air Intake checklist item expanded
	4-6, 4-7, 4-8, 4-10	New switches added to checklist and the order of checks arranged to reflect switch layout, alternative switch label added
	4-12	Switch position label changed
		Annunciator light nomenclature changed
	4-13	Alternative switch position nomenclature added

Revision Number and Date	Revised Pages	Description of Revision
	4-14	Alternative switch nomenclature added
	4-15	Normal landing braking action procedure amended
	4-16	Order of checks arranged to reflect switch layout, alternative switch label added.
	4-18	Oxygen system removed
	4-20	Expanded instructions for air intake check
	4-21	Alternative switch position labels added, reference changed
	4-22	Alternative switch position labels added
	4-23, 4-24	Alternative switch position labels added, procedures changed
	4-25	Alternative switch position labels added, procedures changed. Wording corrected.
	4-26	Alternative switch position labels added, procedures changed, IFR operations added
	4-27	Braking action procedures amended
	5-2	Takeoff example figures amended and figure numbering amended
	5-3 - 5-6 inclusive, 5-15, 5-17, 5-18, 5-20 - 5-28 inclusive	Figure numbers changed.
	5-13, 5-14	New takeoff table for centre of gravity 118.99" aft of datum added and existing table title, speeds and distances amended.
	6-5, 6-6	Tables amended to reflect that weight example is in lbs.
	6-13, 6-14	Equipment added
	6-21	Table arms amended
	7-5	New warning and caution lights added. Units (lbs) added
	7-6	Horizontal Situation Indicator added
	7-14, 7-30, 7-48, 7-50, 7-57	Alternative circuit breaker or switch labels added
	7-59	Schematic amended to include NRV in return line from pump
	7-60	Amended to include NRV in return line from pump
	7-61	Switch position labels changed. Spelling corrected. Equipment identification changed.
	7-67	Alternative battery location added, switch position labels changed
	7-68	Switch position labels changed
	7-72, 7-73	Circuit breaker and switch nomenclatures changed
	7-74	Landing light system description changed and additional switch labels added
	7-75	Cabin ventilation added. Pitot heater circuit breaker rating amended. Voice alert on stall warning added.
	7-76	Description of avionics system expanded
	7-77	Speed warning activation speed amended. Oil cooler heater description expanded and additional switch labels added

Revision Number and Date	Revised Pages	Description of Revision
5 – 5 Dec 2006	Introduction - All	Change of Company Name
	Section 1 - All	Change of Company Name
	Section 2 - All	Change of Company Name
	Section 3 - All	Change of Company Name
	Section 4 - All	Change of Company Name
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	Section 8 - All	Change of Company Name
	Section 9 - Suppl 1 to 49	Change of Company Name
6 – 17 Oct 2007	Introduction – All	Removed header & footer revision bars
	Section 2 – All	Removed header & footer revision bars
	2-12 to 2-20	Placard illustrations moved to centre of pages
	2-14	Deleted illustrations relating to cargo door
	2-18	Added decal requirement for static ports Revised ELT placard requirements
	Section 3 – All	Removed header & footer revision bars
	Table of Contents	Changed Pg Ref
	3-2, 3-5, 3-7, 3-8, 3-9, 3-10, 3-12, 3-17, 3-18 & 3-26	Changed to BATTERY MASTER & GENERATOR MASTER
	3-25	Changed Paragraph to 1 & 2
	Section 4 – All	Removed header & footer revision bars
	4-2, 4-6, 4-8, 4-9, 4-16 & 4-22	Changed to BATTERY MASTER & GENERATOR MASTER
	Section 5 – All	
	5-2	Removed reference to table 5-8
	5-14	Removed TAKE OFF PERFORMANCE - Centre of Gravity119.00 and table 5-8
	Section 7 – All	Removed header & footer revision bars
	Table of Contents	Changed Pg Ref
	7-7	Removed “airpath” from sentence
	7-9, 7-10, 7-7-11, 7-37, 7-47, 7-62, 7-64, 7-65, 7-66, 7-67, 7-69 & 7-71	Changed to BATTERY MASTER & GENERATOR MASTER
	7-10	Corrected paragraph OPERATING FEATURES AND DISPLAY MODES
	7-17	Corrected paragraph CREW ENTRY DOORS
	7-18	Corrected paragraph ENGINE GENERAL DESCRIPTION
	7-19	Corrected paragraph ENGINE OPERATION DESCRIPTION
	7-55, 7-56 & 7-57	Changed paragraph SYSTEM OPERATION
	7-57	Changed paragraph TANKS

Revision Number and Date	Revised Pages	Description of Revision
	7-58	Changed paragraph AUXILIARY FUEL PUMP
	7-64	Changed paragraph GCU
	7-65	Changed paragraph to GENERATOR MASTER SWITCH
		Changed paragraph GENERATOR CIRCUIT BREAKER

PILOT'S OPERATING HANDBOOK

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GENERAL

1. This flight manual shall be carried on all flights.

2. Approved supplements listed in Section 9 form part of this flight manual.

3. Pilots must comply with all the limitations contained in the basic manual defined in the list of effective pages and log of revisions, as varied by any applicable approved supplement.

WARNINGS, CAUTIONS AND NOTES

WARNING

An operating procedure, technique or maintenance practice which may result in personal injury or loss of life if not carefully followed.

CAUTION

An operating procedure, technique or maintenance practice which may result in damage to equipment if not carefully followed.

NOTE

An operating procedure, technique or maintenance condition which is considered essential to emphasize.

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SECTION 1

GENERAL

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1.1 INTRODUCTION

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE CIVIL AVIATION AUTHORITY OF NEW ZEALAND AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER, AND CONSTITUTES THE CIVIL AVIATION AUTHORITY OF NEW ZEALAND APPROVED AIRPLANE FLIGHT MANUAL. THIS MANUAL ALSO CONSTITUTES THE FAA APPROVED FLIGHT MANUAL FOR UNITED STATES OF AMERICA OPERATIONS IN ACCORDANCE WITH FAR 21.29 AND EASA APPROVED FLIGHT MANUAL.

This pilot's operating handbook and Civil Aviation Authority of New Zealand approved flight manual shall be carried on all flights.

Sections 1, 2, 3, 4, 5 and 9 are subject to Civil Aviation Authority of New Zealand approval.

WARNING

Pilots must comply with all limitations and directions contained in this handbook and applicable supplements. This handbook is not intended as a guide for instruction or as a training manual. The pilot is responsible for ensuring the airplane is airworthy and for compliance with all applicable regulatory authority regulations and directives.

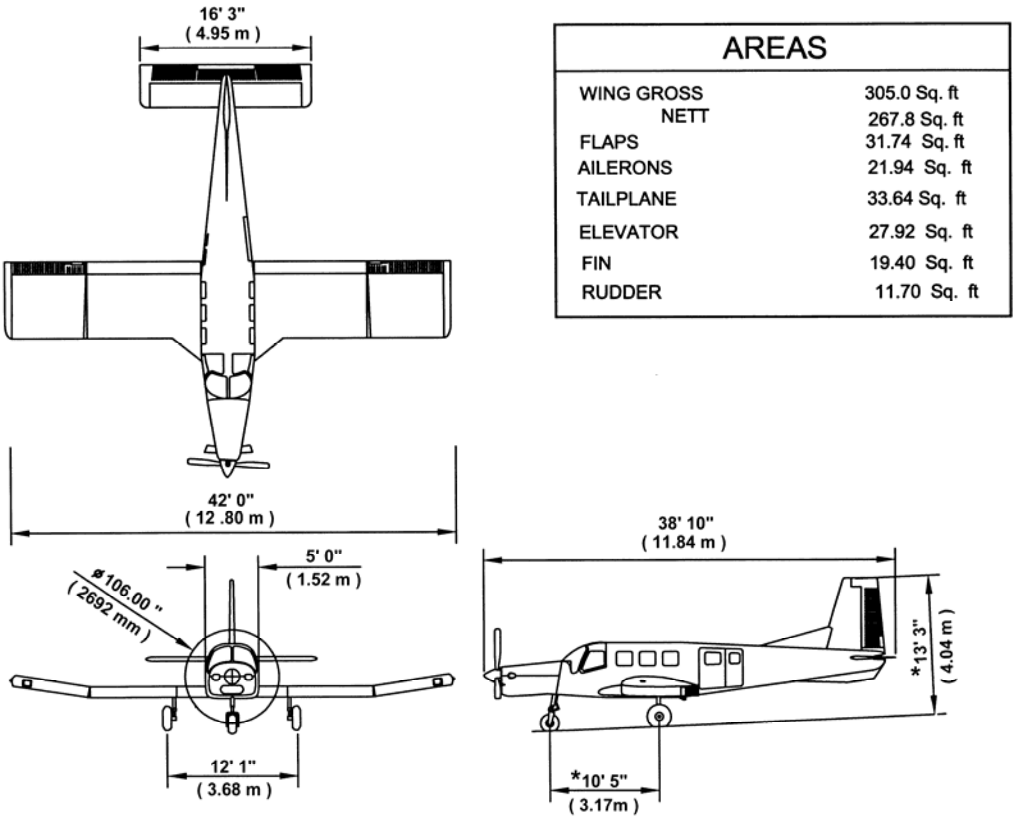
Information on optional equipment offered by Pacific Aerospace Limited will be issued in the form of supplements as part of the revisions process.

Full information on limitations, performance, and weight and balance is given in the pilot's handbook or the flight manual approved by the regulatory authority of the country of registration.

Amendments, when issued, will take the form of revised page(s) to be inserted in lieu of (or in addition to) the existing pages.

Amendments will be denoted by vertical lines in the right hand margin of affected page(s) spanning line(s) of type involved.

1.2 PRINCIPAL DIMENSIONS AND AREAS



AREAS	
WING GROSS	305.0 Sq. ft
NETT	267.8 Sq. ft
FLAPS	31.74 Sq. ft
AILERONS	21.94 Sq. ft
TAILPLANE	33.64 Sq. ft
ELEVATOR	27.92 Sq. ft
FIN	19.40 Sq. ft
RUDDER	11.70 Sq. ft

Figure 1-1

THREE VIEW DRAWING

MINIMUM TURNING RADIUS: 30’ 1 ½” for airplanes with modification PAC/XL/0082 embodied.

40’ 3 ¼ ” for airplanes without modification PAC/XL/0082 embodied.

PROPELLER GROUND CLEARANCE: At normal operating weights, CG limits, tire inflation and oleo extension there is a minimum of 7” propeller ground clearance.

1.3 ENGINE

NUMBER OF ENGINES: 1

MANUFACTURER: Pratt & Whitney, Canada, Incorporated (P&WC)

ENGINE MODEL NUMBER: PT6A-34

ENGINE TYPE: Free turbine, propulsion engine incorporating a multi-stage compressor, single stage compressor turbine, and independent single stage power turbine driving the output shaft through integral planetary gearing. A singular annular combustion chamber, 14 simplex fuel nozzles and two igniter plugs comprise the combustion system. Engine accessories are grouped on the rear of the engine.

HORSEPOWER: 750 shaft horsepower for 5 minutes, maximum continuous 633 shaft horsepower.

1.4 PROPELLER

NUMBER OF PROPELLERS: 1

PROPELLER MANUFACTURER: Hartzell Propeller Incorporated

PROPELLER MODEL NUMBER: HC-B3TN-3D/T10282NS+4

NUMBER OF BLADES: 3

PROPELLER DIAMETER:
Maximum: 106 inches
Minimum: 106 inches

PROPELLER TYPE: Constant speed, full feathering and reversible

PROPELLER ANGLES:
Feathered: 86.3^0
Low Pitch: 18.5^0
Maximum Reverse: -8.1^0

1.5 FUEL

APPROVED FUELS

Approved fuels are detailed in Figure 1-2. Refer to P&WC S.B. No. 1344 for specific details.

APPROVED FUELS	
Jet A /A1 (ASTM D1655)	
Jet B (ASTM D1655)	
JP-4 (MIL-T-5624)	Contains fuel system ice inhibitor
JP-5 (MIL-T-5624)	Contains fuel system ice inhibitor
F-40 (NATO Code)	Contains fuel system ice inhibitor
F-34 (Nato Code)	Contains fuel system ice inhibitor
F-44 (Nato Code)	Contains fuel system ice inhibitor

Figure 1-2, Approved Fuels

FUEL CAPACITY

The fuel capacities are detailed in Figure 1-3.

Total Capacity: 861 litres (227.4 U.S. gallons, 1512 lbs)
Total Useable: 841 litres (221 U.S. gallons, 1476 lbs)

TANK	TOTAL CAPACITY	UNUSABLE FUEL	USABLE
FRONT LEFT TANK *	284* litres, 499 lbs 75* U.S. gallons	10 litres, 18 lbs 3 U.S. gallons	274 litres, 481 lbs 72 U.S. gallons
FRONT RIGHT TANK	293 litres, 515 lbs 77 U.S. gallons	10 litres, 18 lbs 3 U.S. gallons	283 litres, 497 lbs 74 U.S. gallons
REAR LEFT TANK	142 litres, 249 lbs 37.5 U.S. gallons	0	142 litres, 249 lbs 37.5 U.S. gallons
REAR RIGHT TANK	142 litres, 249 lbs 37.5 U.S. gallons	0	142 litres, 249 lbs 37.5 U.S. gallons
TOTAL	861 litres, 1512 lbs 227 U.S. gallons	20 litres, 36 lbs 6 U.S. gallons	841 litres, 1476 lbs 221 U.S. gallons

* Includes 26 litres (6.8 U.S. gallons, 45 lbs) of fuel in sump tank

Figure 1-3, Fuel Capacity

1.6 OIL

OIL SPECIFICATION

The approved oil brands and types are detailed in Figure 1-4. Refer to P&WC S.B 1001 for full details.

BRAND	TYPE
AeroShell Turbine Oil 750	Synthetic, CPW202 (7.5 Centistokes)
Royco Turbine Oil 750	Synthetic, CPW202 (7.5 Centistokes)
Castrol 98	Synthetic, CPW202 (7.5 Centistokes)
BP Turbo Oil 274	Synthetic, CPW202 (7.5 Centistokes)
Turbonycoil 35 M	Synthetic, CPW202 (7.5 Centistokes)
AeroShell Turbine Oil 500	Synthetic, PWA 521- Type II (5 Centistokes)
Royco Turbine Oil 500	Synthetic, PWA 521- Type II (5 Centistokes)
Mobil Jet Oil II	Synthetic, PWA 521- Type II (5 Centistokes)
Castrol 5000	Synthetic, PWA 521- Type II (5 Centistokes)
BP Turbo Oil 2380	Synthetic, PWA 521- Type II (5 Centistokes)
Turbonycoil 525-2A	Synthetic, PWA 521- Type II (5 Centistokes)
Turbonycoil 600	Synthetic, PWA 521- Type II (5 Centistokes)
Mobil Jet Oil 254	Synthetic, PWA 521- Type II (5 Centistokes) THIRD GENERATION
AeroShell Turbine Oil 560	Synthetic, PWA 521- Type II (5 Centistokes) THIRD GENERATION
Royco Turbine Oil 560	Synthetic, PWA 521- Type II (5 Centistokes) THIRD GENERATION

Figure 1-4, Oil Specifications

CAUTION

Do not mix different viscosities or specifications of oil as their different chemical structure can make them incompatible. Drain the complete oil system before changing oil viscosities or specifications.

CAUTION

When changing from an existing lubricant formulation to a "Third Generation" lubricant formulation P&WC strongly recommends that such a change should only be made when an engine is new or freshly overhauled.

NOTE

Where operation will result in frequent cold soaking at ambient temperature of -18^{0}C (0^{0}F) or lower, use of a 5 centistoke oil is recommended.

OIL TANK CAPACITY 8.7 litres (2.3 U.S. gallons / 1.9 Imperial gallons)

OIL QUANTITY OPERATING RANGE The maximum limit is MAX HOT or MAX COLD as shown on the dipstick. The MAX HOT marking on the dipstick is used to check the engine oil level within 20 minutes of engine shutdown, preferably 10 minutes after shutdown. The MAX COLD marking on the dipstick is used to check the engine oil level when the engine is cold. The minimum limit is 3 quarts below the MAX HOT or MAX COLD.

WARNING

The oil dipstick must be secured and locked in the appropriate position before flight otherwise oil loss will occur and engine failure will follow.

NOTE

Filling the oil level to the maximum level may result in a high consumption rate, with the oil exiting through the accessory gearbox breather. Refer to Section 8 for the recommended procedure to establish the specific operating range for the airplane engine and acceptable consumption rates.

1.7 MAXIMUM CERTIFIED WEIGHTS

MAXIMUM CERTIFIED TAKEOFF WEIGHT: 7500 lbs

MAXIMUM CERTIFIED LANDING WEIGHT: 7125 lbs

1.8 TYPICAL AIRPLANE WEIGHTS

BASIC EMPTY WEIGHT:	3100 lbs
MAXIMUM USEFUL LOAD: (will vary with basic empty weights)	4400 lbs

1.9 CABIN AND ENTRY DIMENSIONS

CABIN WIDTH: (maximum width)	54 inches
CABIN LENGTH: (measured from behind pilot's seat to rear cabin bulkhead)	158 inches
CABIN HEIGHT: (maximum height)	56 inches
ENTRY WIDTH: (varies depending on door type)	50 inches - 48 inches
ENTRY HEIGHT:	47 inches - 45 inches (front of door frame) 41.3 inches - 39.3 inches (rear of door frame)
SILL HEIGHT: (with oleos fully extended)	44 inches

1.10 SPECIFIC LOADINGS

WING LOADING:	24.59 lb/ft^2
POWER LOADING:	10 lbs/shp

1.11 WING

DIHEDRAL CENTRE WING:	0°
DIHEDRAL OUTER PANELS:	8°
INCIDENCE:	2°

1.12 LANDING GEAR

TYPE:	Non retracting, nose wheel steering
NOSE WHEEL STEERING RANGE:	41° to the left and 45° right of neutral – With modification PAC/XL/0082. 20° to the left and 25° right of neutral – Without modification PAC/XL/0082.
MAIN TIRES:	8.50 inches x 10 inches
NOSE TIRES:	8.50 inches x 6 inches
TIRE PRESSURES:	Main 40 psi (airplane unladen) Nose 30 psi (airplane unladen)

1.13 SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

CAS	*Calibrated Airspeed* means the indicated speed of an airplane, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KCAS	Calibrated Airspeed expressed in knots.
Ground Speed	*Ground Speed* is the speed of an airplane relative to the ground.
IAS	*Indicated Airspeed* is the speed of an airplane as shown in the airspeed indicator when corrected for instrument error. IAS values published in the handbook assume zero instrument error.
KIAS	Indicated airspeed expressed in knots.
TAS	*True Airspeed* is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
KTAS	True airspeed expressed in knots.
V_A	*Maneuvering Speed* is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{FE}	*Maximum Flap Extended Speed* is the highest speed permissible with wing flaps in the prescribed extended position.
V_{NE}	*Never Exceed Speed* is the speed limit that may not be exceeded at any time. V is expressed in knots.
V_{NO}	*Maximum Structural Cruising Speed* is the speed that should not be exceeded except in smooth air and then only with caution.
V_S	*Stalling Speed* or the minimum steady flight speed at which the airplane is controllable.
V_{SO}	*Stalling Speed* or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
V_x	*Best Angle of Climb Speed* is the speed which delivers the greatest gain of altitude in the shortest possible horizontal distance.

V_Y — *Best Rate of Climb Speed* is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

METEOROLOGICAL TERMINOLOGY

ISA — *International Standard Atmosphere* in which:
(1) The air is a dry perfect gas,
(2) The temperature at sea level is 15^0C (59^0F),
(3) The pressure at sea level of 29.92 inches hg (1013.25 mb),
(4) The temperature gradient from sea level to the altitude at which the temperature is –56.5^0C (-69.7^0F) is –0.00198^0C (-0.003564^0F) per foot and zero above that altitude. The altitude temperature relationships are shown on Graph 7.

OAT — *Outside Air Temperature* is the free air static temperature, obtained either from in flight temperature indications or ground meteorological sources, adjusted for instrument error and compressibility effects.

Indicated Pressure Altitude — *Indicated Pressure Altitude* is the number actually read from an altimeter when the barometric subscale has been set to 29.92 inches (1013.25 mb) of mercury.

Pressure Altitude — *Pressure Altitude* is the altitude measured from standard sea level pressure with 29.92. inches (1013.25 mb) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.

Station Pressure — *Station Pressure* is the actual atmospheric pressure at field elevation.

Wind — Wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported wind.

POWER TERMINOLOGY

Take Off Power: — The maximum power permissible for takeoff and is limited to a maximum of 5 minutes under normal operation.

Maximum Continuous Power (MCP): — Is the maximum power rating not limited by time.

Reverse Thrust: — The thrust of the propeller directed opposite the usual direction, thereby producing a braking action.

Zero Thrust: — The absence of appreciable thrust, in either direction.

Flameout: Is the unintentional loss of combustion chamber flame during operation.

Hot Start: Is an engine start, or attempted start, which results in an ITT of 1090 ^{0}C being exceeded.

Windmill: Is the propeller rotation from airstream inputs.

psi: Is pounds per square inch.

ENGINE CONTROLS AND INSTRUMENTS

Power Lever: The lever used to control engine power, from the lowest through the highest power, by controlling propeller pitch, fuel flow, engine speed or any combination of these.

Propeller Lever: The lever used to select a propeller speed. In the maximum decrease rpm position it will feather the propeller.

Fuel Condition Lever: The lever is the primary control for starting and stopping the engine.

Propeller Governor: The device that regulates the rpm of the engine/propeller by increasing or decreasing the propeller pitch, through a pitch change mechanism in the propeller hub.

ITT: Inter-Turbine Temperature measured and indicated in degrees centigrade. It is the gas temperature in the turbine section of the engine.

$N_{G:}$ Gas generator rpm expressed as a percentage.

$N_{P:}$ Power output shaft rpm expressed as a percentage.

Torque: Torque is a rotational force exerted by the engine on the propeller.

Beta Range: The mode in which propeller blade pitch is controlled by the power lever.

GCU: Generator Control Unit.

rpm: Is revolutions per minute.

SHP: Shaft Horsepower and is the power delivered at the propeller shaft.

AIRCRAFT PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Climb Gradient:	The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity:	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests.
g:	Is the unit of acceleration equivalent to that produced by the force of gravity
LPH:	Is Liters Per Hour and is the amount of fuel used per hour measured in liters.
pph:	Is pounds per hour and is the amount of fuel used per hour measured in pounds.
fpm:	Is feet per minute and is the rate of climb or descent expressed in feet per minute.
nm:	Is the linear unit nautical mile which is 2025 yards or 1852 meters.
ft:	Is the linear measurement of 12 inches or 30.48 centimeters.
lb:	Is a unit of weight equal to 16 ounces or 0.4536 kilograms.
L:	Is liter.

WEIGHT AND BALANCE

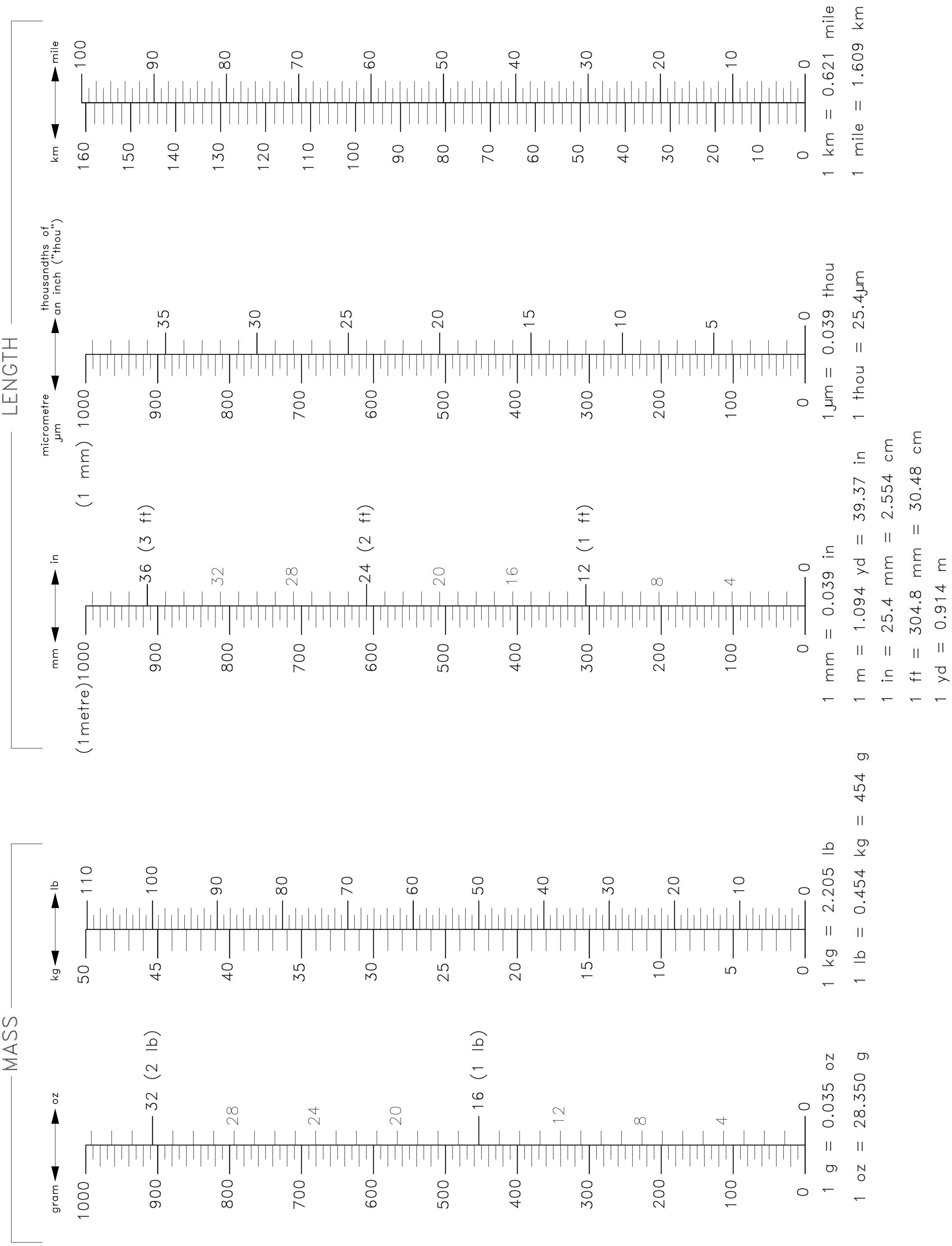
Reference Datum:	*Reference Datum* is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station:	*Station* is a location along the airplane fuselage given in terms of the distance from the reference datum.
Arm:	*Arm* is the horizontal distance from the reference datum to the centre of gravity of an item.
Moment:	*Moment* is the product of the weight of an item multiplied by its arm. Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits.
Centre of Gravity:	*Centre of Gravity* is the point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

CG Arm:	*Centre of Gravity Arm* is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
CG Limits:	*Centre of Gravity Limits* are the extreme centre of gravity locations within which the airplane must be operated at a given weight.
Usable Fuel:	Is the amount of fuel available for flight planning.
Unusable Fuel:	Is the quantity of fuel remaining after a run out test has been completed in accordance with the governmental regulations. This fuel cannot be used in flight.
Basic Empty Weight:	The *Basic Empty Weight* includes unusable fuel, operating fluids, including engine oil and items listed as removable equipment.
Payload:	*Payload* is the weight of occupants, cargo and baggage.
Useful Load:	*Useful Load* is the difference between take off weight and basic empty weight.
Maximum Takeoff Weight :	*Maximum Takeoff Weight* is the maximum weight approved for the start of the takeoff roll.
Maximum Landing Weight:	*Maximum Landing Weight* is the maximum weight approved for landing touchdown.
kg:	Is kilogram.

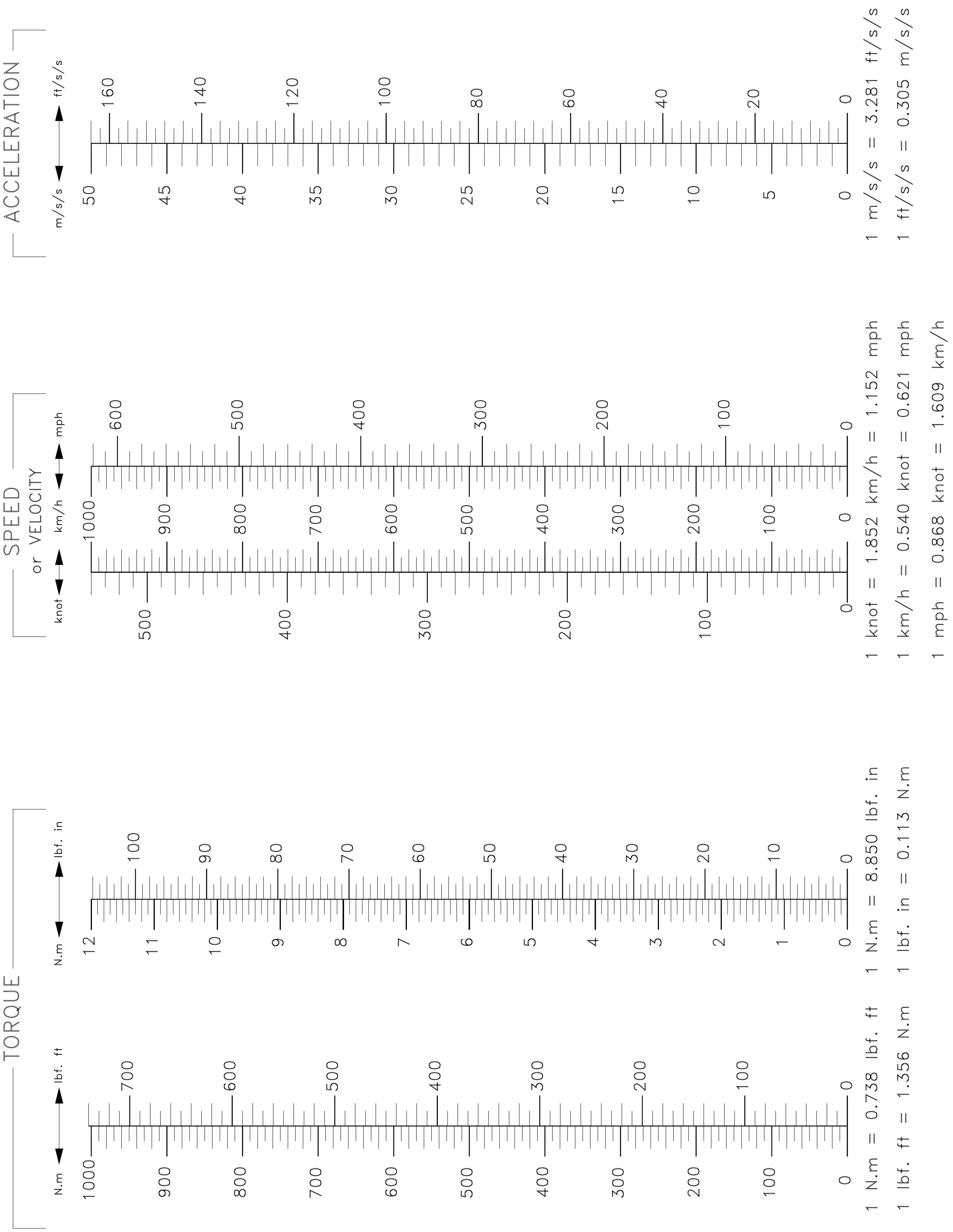
1.14 TABLES AND GRAPHS

No 1	Conversion Graph -Mass and Length
No 2	Conversion Graph -Torque, Speed and Acceleration
No 3	Conversion Graph -Area, Volume and Force
No 4	Conversion Graph –Pressure
No 5	Conversion Graph -Temperature, Energy and Power

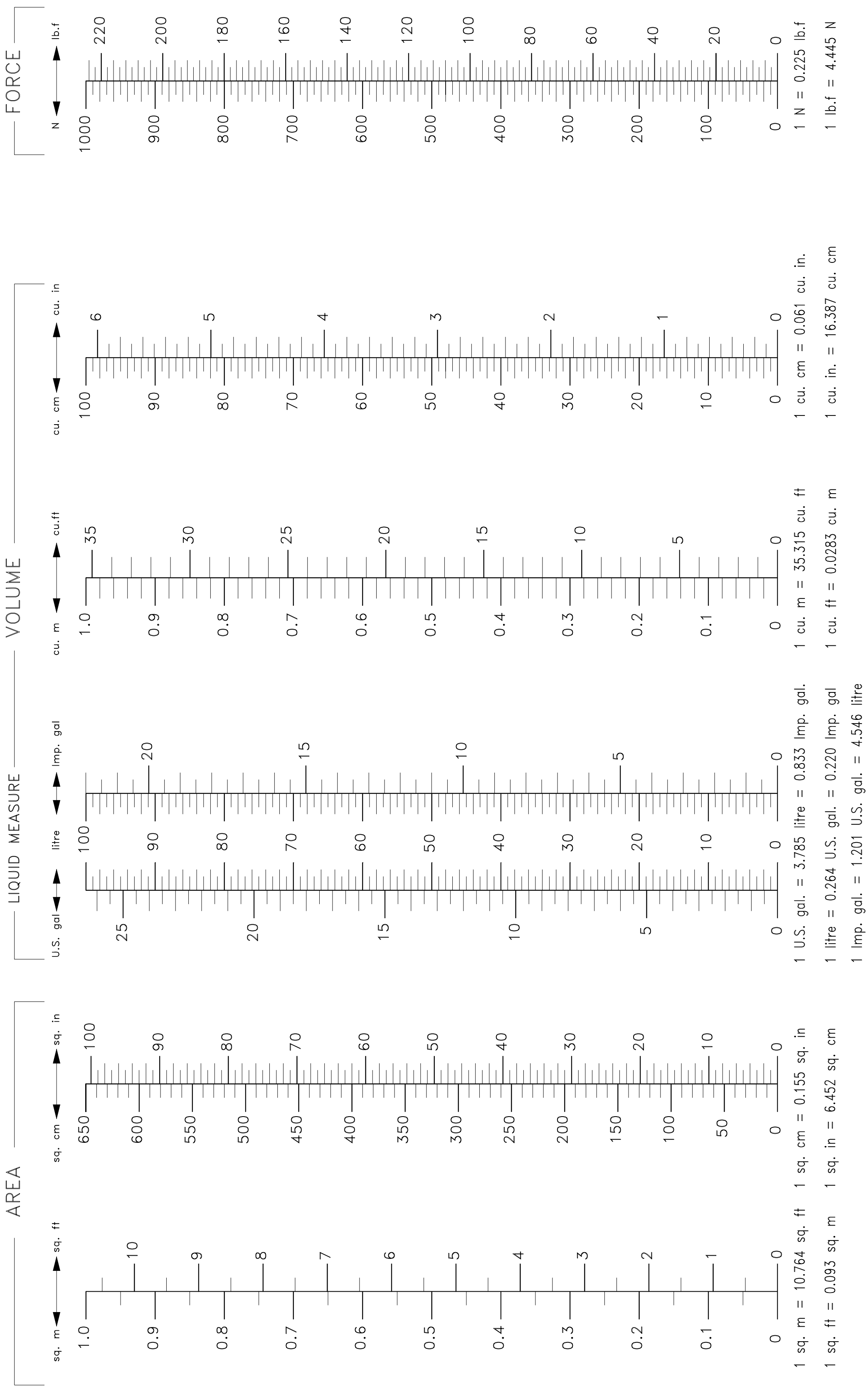
GRAPH No. 1 Conversion - Mass and Length



GRAPH No. 2 Conversion - Torque, Speed and Acceleration

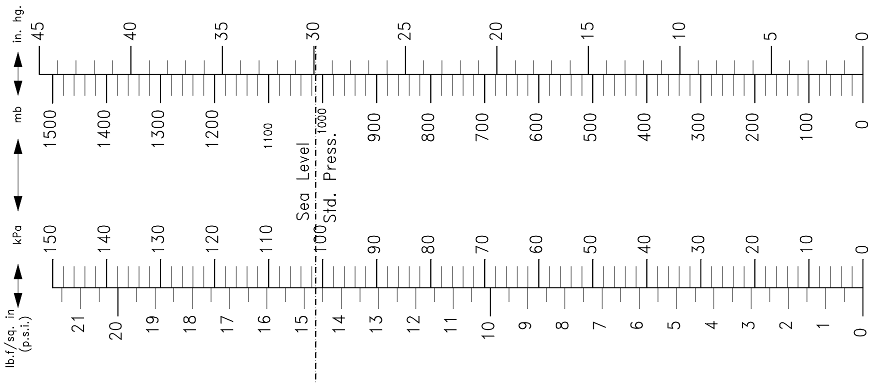


GRAPH No. 3 Conversion - Area, Volume and Force

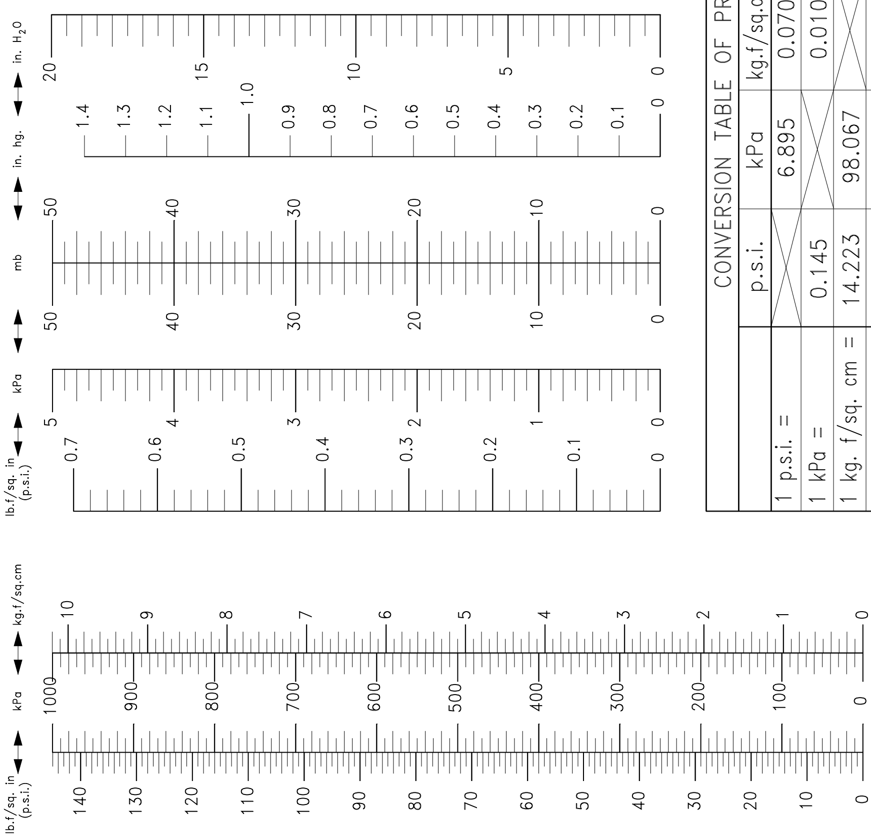


GRAPH No. 4 Conversion - Pressure

PRESSURE



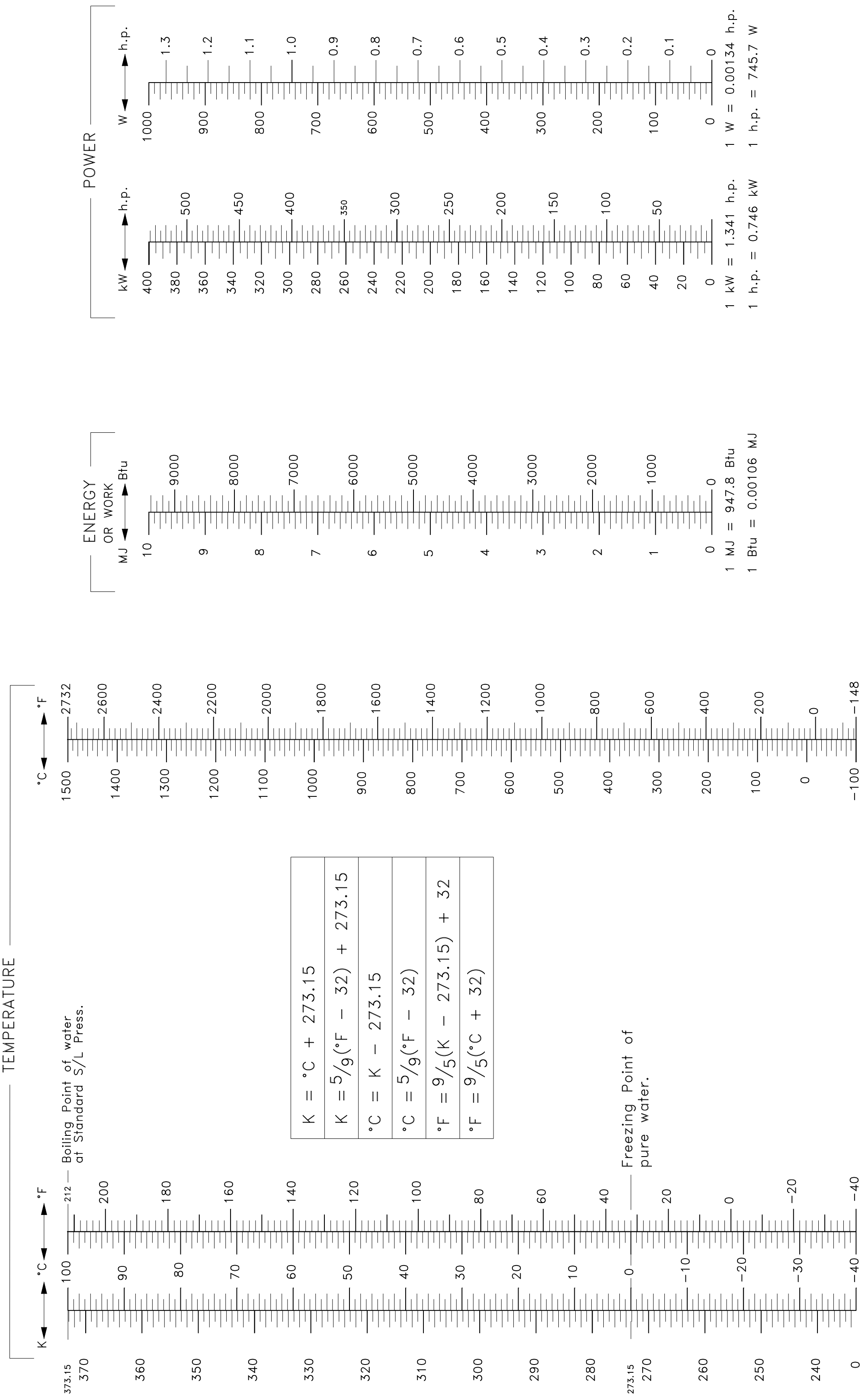
p.s.i.	14.7
kPa	101.3
mb	1013
in. hg.	29.92



CONVERSION TABLE OF PRESSURE UNITS

	p.s.i.	kPa	kg.f/sq.cm	mb	in. hg	in. H_2O
1 p.s.i. =		6.895	0.070	68.948	2.036	27.680
1 kPa =	0.145		0.010	10.00	0.295	4.015
1 kg. f/sq. cm =	14.223	98.067		980.665	28.959	393.712
1 mb =	0.015	0.100	0.001		0.030	0.401
1 in. hg =	0.491	3.386	0.035	33.864		13.595
1 in. H_2O =	0.037	0.249	0.003	2.491	0.074	

GRAPH No. 5 Conversion - Temperature, Energy and Power



SECTION 2

LIMITATIONS

TABLE OF CONTENTS

2.1 INTRODUCTION

Section 2 details the limits applicable to the engine, airframe, propeller and associated equipment and the associated instrument markings and placards applicable to operation of the airplane. The Civil Aviation Authority of New Zealand, the United States of America Federal Aviation Administration and the European Aviation Safety Agency approve the limitations included in this section.

2.2 KINDS OF OPERATIONS LIMITS

The airplane is not approved for flight into forecast or known icing conditions. The pilot is to fly the airplane clear of icing conditions if inadvertently encountered.

Day and Night VFR operations are approved. IFR operations are permitted only when the appropriate equipment required by the regulatory authority is installed.

The following list identifies the systems and equipment upon which type certification for each kind of operation was predicated. These systems and equipment items must be installed and operable for the particular kind of operation indicated. Reference should also be made to the Equipment List in Section 6, Weight and Balance and Section 9 Supplements for additional equipment information. The pilot is responsible for determining the airworthiness of the airplane for each flight and for assuring compliance with all current appropriate operating rules and regulations in the country of operation.

REQUIRED EQUIPMENT

	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT
Communications				
Communication Radio (VHF)	0*	0*	1*	1*
Electrical Power				
Battery	1	1	1	1
Starter Generator	1	1	1	1
Dual Bus Electrical system	0	0	1	1
Ammeter/Voltmeter	1	1	1	1
Generator Warning Light	1	1	1	1
Generator Control Unit	1	1	1	1
Bus Fault Warning Light	1	1	1	1
Fire Protection				
Fire Extinguisher	1	1	1	1
Flight Controls				
Flap System	1	1	1	1
Flap Position Indicator	1	1	1	1
Aileron Trim	1	1	1	1
Elevator Electric Trim	1	1	1	1
Elevator Manual Trim	1	1	1	1
Rudder Trim	1	1	1	1
Trim Position Indicators (3 installed)	3	3	3	3
Stall Warning System	1	1	1	1
Airspeed Overspeed Warning System	1	1	1	1
Fuel				
Auxiliary Electric Fuel Pump (1 installed)	1	1	1	1
Auxiliary Fuel Pump On Light	1	1	1	1
Fuel Quantity Indicators (2 installed)	2	2	2	2
Fuel Pressure Low Warning	1	1	1	1
Low Level Fuel Warning	1	1	1	1

	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT
Fuel				
Fuel Flow Indicator	1	1	1	1
Fuel Filter Bypass Warning	1	1	1	1
Ice and Rain Protection				
Pitot Heat	1	1	1	1
Pitot Heat Inoperative Light	1	1	1	1
Oil Cooler Heater	1	1	1	1
Inertial Separator	1	1	1	1
Engine Anti-Ice Light	1	1	1	1
Static Port Heat	0	0	1	1
Windscreen Demister	0	0	1	1
Instruments				
Clock	0	0	1	1
Lights				
Navigation/Position Lights	3	3	3	3
Landing Lights	1	1	1	1
Strobe Lights (Wing tip)	2	2	2	2
Post, Avionics and Switch Instrument Lights	✓	✓	✓	✓
Overhead Map Light	0	0	1	1
Navigation				
Altimeter	1	1	1	1
Airspeed Indicator	1	1	1	1
Magnetic Compass	1	1	1	1
Outside Air Temperature Indicator	1	1	1	1
Artificial Horizon	0	0	1	1
Horizontal Situation Indicator	0	0	1	1
Rate of Turn and Slip Indicator	0	1	1	1
Vertical Speed Indicator	0	0	1	1
Navigation Equipment	*	*	*	*
Assigned Altitude Indicator	0	0	1	1
Propeller				
Beta Indicator Light	1	1	1	1
Engine Indicating				
Ng Indicator	1	1	1	1
Np Indicator	1	1	1	1
ITT Indicator	1	1	1	1
Torque Indicator	1	1	1	1
Starter Energised Light	1	1	1	1
Ignition On Light	1	1	1	1
Engine Oil				
Oil Pressure and Temperature Indicator	1	1	1	1
Oil Pressure Warning Light	1	1	1	1
Chip Detector Warning Light	1	1	1	1
Oil Dipstick	1	1	1	1
Miscellaneous				
Heater Hot Warning Light	1	1	1	1
Map Storage	0	0	1	1
Emergency Locator Beacon	1	1	1	1
Lightning Protection (PAC/XL/0199)	0**	0**	✓	✓
Static Discharge Wicks	0**	0**	✓	✓

***** As required by the applicable operating rules. ** Required for EASA certificated airplanes

2.3 AIRSPEED LIMITATIONS

The airspeed limitations are detailed in Figure 2-1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	171	170	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruise Speed	141	140	Do not exceed this speed except in smooth air and then only with caution.
V_A/ V_O	Maneuvering Speed 7500 lbs 6500 lbs 5500 lbs 4500 lbs	132 123 113 102	131 122 112 101	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed 0^0 - 20^0 Flap 20^0 - 40^0 Flap	 128 117	 130 120	Do not exceed this speed with a given flap setting

Figure 2-1, Airspeed Limitations

2.4 AIRSPEED INDICATOR MARKINGS

The airspeed indicator markings are detailed in Figure 2-2.

MARKING	KIAS	SIGNIFICANCE
White Arc	58 - 120	Full flap operating range. Lower limit is maximum weight stalling speed in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	69 - 140	Normal operating range. Lower limit is maximum weight stalling speed with flaps retracted. Upper limit is maximum structural cruising speed
Yellow Arc	140 - 170	Operations must be conducted with caution and only in smooth air.
Red Line	170	Maximum speed for all operations

Figure 2-2, Airspeed Indicator Markings

2.5 POWER PLANT LIMITATIONS

NUMBER OF ENGINES: 1

MANUFACTURER: Pratt & Whitney, Canada, Incorporated (P&WC)

ENGINE MODEL NUMBER: PT6A-34

ENGINE OPERATING LIMITS: Refer Figure 2-5

FUEL GRADE: Approved fuels are detailed in Figure 2-3. Refer to P&WC S.B. No. 1344 for specific details.

APPROVED FUELS	
Jet A /A1 (ASTM D1655)	
Jet B (ASTM D1655)	
JP-4 (MIL-T-5624)	Contains fuel system ice inhibitor
JP-5 (MIL-T-5624)	Contains fuel system ice inhibitor
F-40 (NATO Code)	Contains fuel system ice inhibitor
F-34 (Nato Code)	Contains fuel system ice inhibitor
F-44 (Nato Code)	Contains fuel system ice inhibitor

Figure 2-3, Approved Fuels

OIL GRADE: The approved oil brands and types are detailed in Figure 2-4. Refer to P&WC S.B 1001 for full details.

BRAND	TYPE
AeroShell Turbine Oil 750	Synthetic, CPW202 (7.5 Centistokes)
Royco Turbine Oil 750	Synthetic, CPW202 (7.5 Centistokes)
Castrol 98	Synthetic, CPW202 (7.5 Centistokes)
BP Turbo Oil 274	Synthetic, CPW202 (7.5 Centistokes)
Turbonycoil 35 M	Synthetic, CPW202 (7.5 Centistokes)
AeroShell Turbine Oil 500	Synthetic, PWA 521- Type II (5 Centistokes)
Royco Turbine Oil 500	Synthetic, PWA 521- Type II (5 Centistokes)
Mobil Jet Oil II	Synthetic, PWA 521- Type II (5 Centistokes)
Castrol 5000	Synthetic, PWA 521- Type II (5 Centistokes)
BP Turbo Oil 2380	Synthetic, PWA 521- Type II (5 Centistokes)
Turbonycoil 525-2A	Synthetic, PWA 521- Type II (5 Centistokes)
Turbonycoil 600	Synthetic, PWA 521- Type II (5 Centistokes)
Mobil Jet Oil 254	Synthetic, PWA 521- Type II (5 Centistokes) THIRD GENERATION
AeroShell Turbine Oil 560	Synthetic, PWA 521- Type II (5 Centistokes) THIRD GENERATION
Royco Turbine Oil 560	Synthetic, PWA 521- Type II (5 Centistokes) THIRD GENERATION

Figure 2-4, Oil Specifications

CAUTION

Do not mix different viscosities or specifications of oil as their different chemical structure can make them incompatible. Drain the complete oil system before changing oil viscosities or specifications.

CAUTION

When changing from an existing lubricant formulation to a "Third Generation" lubricant formulation P & WC strongly recommends that such a change should only be made when an engine is new or freshly overhauled.

NOTE

Where operation will result in frequent cold soaking at ambient temperatures of -18^{0}C (0^{0}F) or lower, use of a 5 centistoke oil is recommended.

NUMBER OF PROPELLERS:	1	
PROPELLER MANUFACTURER:	Hartzell Propeller Incorporated	
PROPELLER MODEL NUMBER:	HC-B3TN-3D/T10282NS+4	
NUMBER OF BLADES:	3	
PROPELLER DIAMETER:	Maximum 106 inches Minimum 106 inches	
PROPELLER ANGLES:	Feathered:	86.3^0
	Low Pitch:	18.5^0
	Maximum Reverse:	-8.1^0

STARTER DUTY CYCLE: Using internal and external power the starting cycle is limited to the following intervals and sequence:

30 seconds ON	60 seconds OFF
30 seconds ON	60 seconds OFF
30 seconds ON	30 minutes OFF

POWER PLANT LIMITATIONS

POWER SETTING	TORQUE psi	MAX. ITT °C	GAS GEN. RPM % Ng	PROP RPM % Np (RPM)	OIL PRESS psi	OIL TEMP. °C	SHAFT HORSE-POWER
Takeoff	64.5 (2)	790	101.6	91.2 (2006)	85-105	10-99	750 (31 °C)
Maximum Continuous	54	740	101.6	91.2 (2006)	85-105	10-99	633
Maximum Climb	54	740	101.6	91.2 (2006)	85-105	0-99	633
Maximum Cruise	64.5 (2) 54	790 740	101.6 101.6	91.2 (2006) 91.2 (2006)	85-105 85-105	0-99 0-99	750 633
Idle	-	685	52-54	-	40	-40-99	-
Maximum Reverse	64.5 (2)	790	101.6	86 (1892)	85-105	0-99	-
Transient	68.4 (5)	850 (3)	102.6 (3)	100 (2200)	85-105	0-99	-
Starting	-	1090 (3) (4)	-	-	-	-40	-

(1) All limits are based on sea level
(2) 5 minute time limit
(3) These values are limited to two (2) seconds
(4) Starting temperatures above 850°C should be investigated for cause
(5) Time limited to 20 seconds

Figure 2-5, Power Plant Limitations

ENGINE CONTROL OPERATING LIMITS

Flight operation with the power lever retarded below the FLIGHT IDLE position is prohibited. Positioning of the power lever below the FLIGHT IDLE position may lead to the loss of airplane.

2.6 POWER PLANT INSTRUMENT MARKINGS

The power plant instrument markings and the colour significance are detailed in Figure 2-6.

INSTRUMENT	RED LIGHT	GREEN LIGHTS	YELLOW LIGHTS	RED LIGHTS
	MINIMUM LIMIT	NORMAL OPERATING	CAUTION RANGE	MAXIMUM LIMIT
Torque Indicator		10-53 psi	54-64.5 psi	>64.5 psi
Inter Temperature Indicator		1-789 ^{o}C		790 ^{o}C
Gas Generator % RPM Indicator		1-101.6%		>101.6%
Propeller RPM Indicator		1-91.2% (22-2006 RPM)		>91.2% (>2006 RPM)
Oil Temperature Indicator		15-99 ^{o}C	0-14 ^{o}C	>99 ^{o}C
Oil Pressure Indicator	25 psi	85-105 psi	26-84	>105 psi

Figure 2-6, Power Plant Instrument Markings

NOTE

Refer to the digital display for accurate instrument readings. Analogue lights will display within 1% of digital reading.

2.7 MISCELLANEOUS INSTRUMENT MARKINGS

The markings for the miscellaneous instruments and their colour significance are shown in Figure 2-7.

INSTRUMENT	RED LIGHT *	GREEN LIGHTS	YELLOW LIGHT	RED LIGHT
	MINIMUM LIMIT	NORMAL OPERATING	CAUTION RANGE	MAXIMUM LIMIT
Fuel Quantity Indicators	<1/8	>1/4 - FULL	1/8 – 1/4	-

- There are no red lights for the minimum limit on the rear tank fuel quantity indicator.

Figure 2-7 Miscellaneous Instrument Markings

2.8 WEIGHT LIMITS

MAXIMUM TAKEOFF: 7500 lbs

MAXIMUM LANDING: 7125 lbs

2.9 CENTRE OF GRAVITY LIMITS

FORWARD: 100.46 inches (0.3% Mean Aerodynamic Chord (MAC) aft of datum at 4209 lbs or less with straight line variation to 103.18 inches (3.47% MAC) aft of datum at 5639 lbs, and straight line variation to 111.55 inches (13.25% MAC) aft of datum at 7500 lbs.

AFT: 125.60 inches (29.67%) aft of datum.

REFERENCE DATUM: The airplane datum is at station 0.00 which lies 100.21 inches forward of the wing leading edge.

MEAN AERODYNAMIC CHORD: The leading edge of the MAC is 100.21 inches aft of the datum. The MAC length is 85.584 inches.

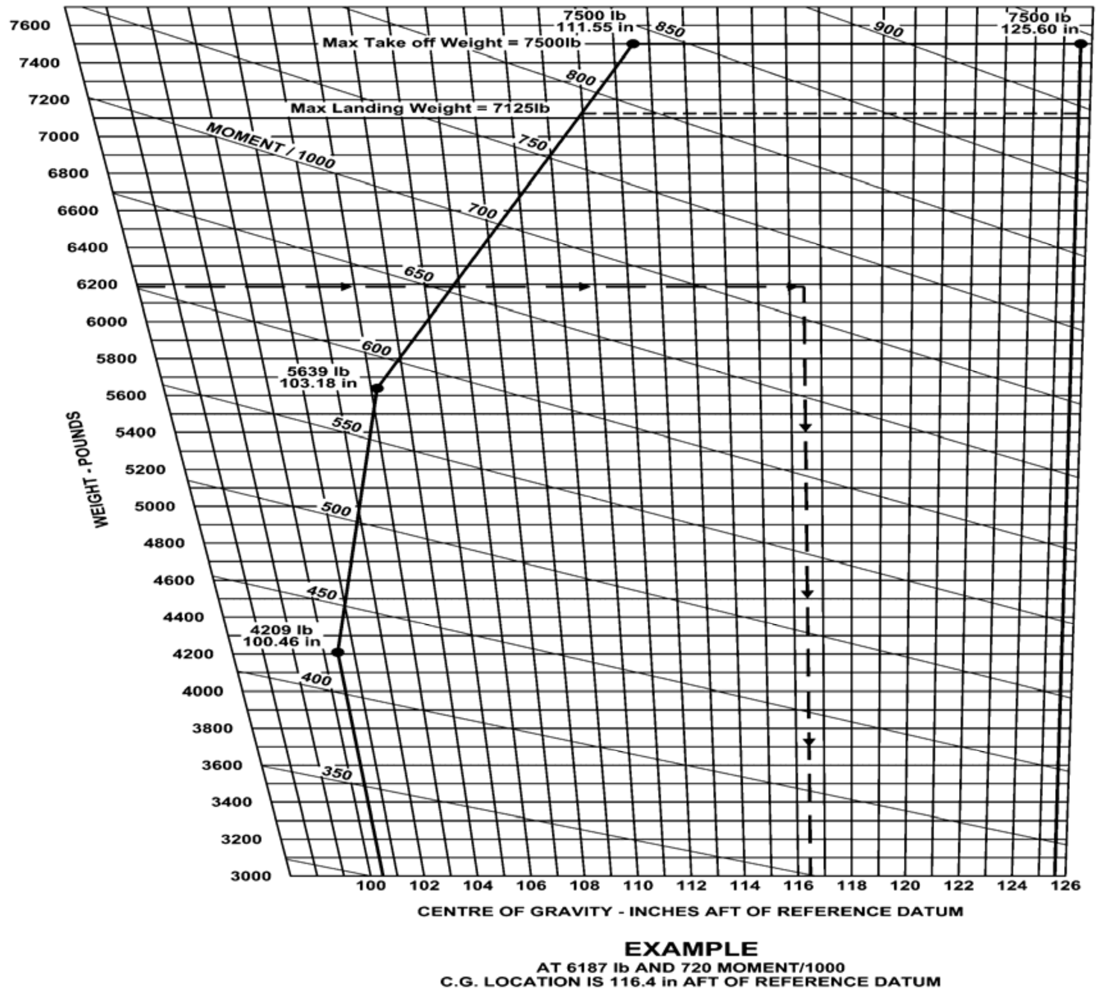


Figure 2-8, Centre of Gravity Envelope

2.10 MANOEUVRE LIMITS

The airplane is certified in the Normal Category. Manoeuvres shall be limited to normal flying manoeuvres, but may include straight and steady stalls and turns in which the angle of bank does not exceed 60^0. All aerobatic manoeuvres, including spins are prohibited.

2.11 FLIGHT LOAD FACTOR LIMITS

	g	g
FLAPS UP:	+3.47	-1.39
FLAPS TAKEOFF:	+3.0	0
FLAPS LANDING:	+3.0	0

2.12 FLIGHT CREW LIMITS

The minimum crew is one pilot, seated in the left seat.

2.13 FUEL LIMITATIONS

The fuel limitations are detailed in Figure 2-9.

Total Capacity: 861 litres (227.4 U.S. gallons, 1512 lbs)
Total Useable: 841 litres (221 U.S. gallons, 1476 lbs)

TANK	TOTAL CAPACITY	UNUSABLE FUEL	USABLE
FRONT LEFT TANK *	284* litres, 499 lbs 75* U.S. gallons	10 litres, 18 lbs 3 U.S. gallons	274 litres, 481 lbs 72 U.S. gallons
FRONT RIGHT TANK	293 litres, 515 lbs 77 U.S. gallons	10 litres, 18 lbs 3 U.S. gallons	283 litres, 497 lbs 74 U.S. gallons
REAR LEFT TANK	142 litres, 249 lbs 37.5 U.S. gallons	0	142 litres, 249 lbs 37.5 U.S. gallons
REAR RIGHT TANK	142 litres, 249 lbs 37.5 U.S. gallons	0	142 litres, 249 lbs 37.5 U.S. gallons
TOTAL	861 litres, 1512 lbs 227 U.S. gallons	20 litres, 36 lbs 6 U.S. gallons	841 litres, 1476 lbs 221 U.S. gallons

Figure 2-9 Fuel Limitations

(1) * The total includes 26 litres (6.8 U.S. gallons, 45 lbs) of fuel in the sump tank.

(2) The fuel tank capacity is based on the tanks being filled to the top of the filler neck in each tank.

(3) Maximum fuel imbalance between the left and right fuel tanks in flight is 100 litres (26.4 U.S. gallons, 176 lbs)

(4) Due to possible fuel starvation, the duration of maximum full rudder sideslips is 5 minutes.

2.14 CLIMB CONDITION LIMITS

Maintain power plant within the operating limitations detailed in Figure 2-5.

2.15 MAXIMUM OPERATING ALTITUDE LIMITS

MAXIMUM OPERATING ALTITUDE: 20000 ft.

NOTE

For operations above 13,000 ft or between 10,000 ft and 13,000 ft for more than 30 minutes, the following oxygen equipment must be carried:

(a) A fixed oxygen supply system supplying each crew member and passenger installed in accordance with acceptable technical data which meets the requirements of the applicable operating rules: or

(b) A portable oxygen supply system for each crew member and passenger which meets the requirements of the applicable operating rules.

2.16 OUTSIDE AIR TEMPERATURE LIMITS

COLD DAY:	-35ºC (-31ºF) from sea level to 25,000 ft.	
HOT DAY:	Ground operations:	+45ºC (113ºF) at sea level.
	Flight operations:	ISA + 30ºC (86ºF) from sea level to 20,000 ft.

NOTE

Engine cooling has been demonstrated to above the ambient temperatures.

2.17 MAXIMUM PASSENGER SEATING LIMITS

The right front seat may be occupied by a passenger.

2.18 BAGGAGE AND CARGO LOADING

MAXIMUM INTENSITY OF LOADING:

The floor load intensity limitations are detailed in figure 2-10.

Aircraft S/N Applicability	Intensity Fwd of Door STA 82 - 187	Intensity Adjacent to Door STA 187 - 240
101, 102	136 lbs/ft^2 (664 kgs/m^2)	50 lbs/ft^2 (244 kgs/m^2)
104 onwards	171 lbs/ft^2 (835 kgs/m^2)	50 lbs/ft^2 (244 kgs/m^2)

Figure 2-10: Floor Load Intensity Limitations

MAXIMUM LOAD PER TIE DOWN POINT: 166 lbs (75 kgs) Applicable for all S/N

MAXIMUM FLOOR LOADINGS: Applicable for all S/N

Compartment station 82 inches aft of datum to 115 inches aft of datum - 1200 lbs

Compartment station 115 inches aft of datum to 166 inches aft of datum - 1200 lbs

Compartment station 166 inches aft of datum to 240 inches aft of datum - 800 lbs

2.19 APPROVED OPERATING SURFACES

Operations are approved on paved and grass surfaces.

2.20 FLAP LIMITATIONS

Approved flap ranges.

TAKEOFF FLAP: 20^o
LANDING FLAP: 40^o

Refer to Section 4 Normal Procedures for recommended flap operating speeds.

2.21 SMOKING

Smoking is not permitted in the airplane.

2.22 PLACARDS

The following operating placards shall be fitted to the airplane in the designated position:

In view of the pilot:

THIS AIRPLANE MUST BE OPERATED IN ACCORDANCE WITH THE AIRPLANE FLIGHT MANUAL.

THIS AIRPLANE IS CERTIFIED IN THE NORMAL CATEGORY.

FLIGHT INTO FORECAST OR KNOWN ICING CONDITIONS PROHIBITED.

MAXIMUM OPERATING ALTITUDE 20,000 FT.

NO ACROBATIC MANOEVURES, INCLUDING SPINS, APPROVED.

SPINS PROHIBITED.

In view of the pilot when the airplane is approved for only day and night VFR.

DAY AND NIGHT VFR OPERATIONS ONLY

In view of the pilot when the airplane is approved for only day VFR.

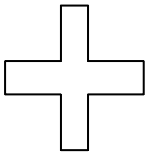
DAY VFR OPERATIONS ONLY

On the cover of the lid between the pilot seat and front passenger seat covering the flight manual, axe and first aid kit:

LIFT HANDLE TO OPEN

FLIGHT MANUAL

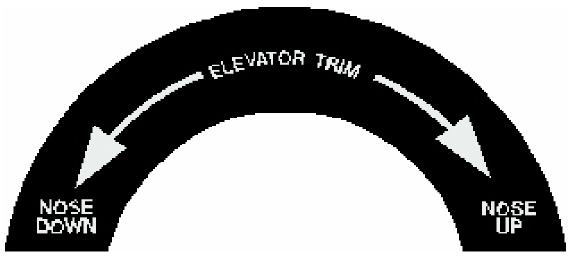
FIRST AID



INSIDE

Adjacent to the elevator manual trim:

ELEVATOR MANUAL TRIM
PULL HANDLE DOWN
ROTATE TO OPERATE
STOW WHEN NOT IN USE



Adjacent to the rudder trim:

Adjacent to the airspeed indicator:

MAXIMUM MANEUVERING SPEEDS

7500 LBS – 131 KIAS
6500 LBS - 122 KIAS
5500 LBS – 112 KIAS
4500 LBS – 101 KIAS

MAXIMUM FLAP EXTENDED SPEED

20^0 – 130 KIAS
40^0 – 120 KIAS

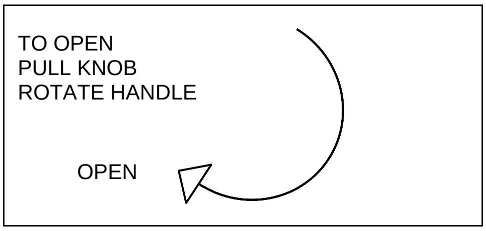
On the instrument panel:

NO SMOKING

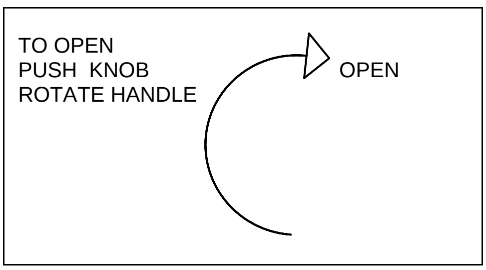
Adjacent to the left and right cabin ventilation levers:

CABIN AIR
PULL COLD

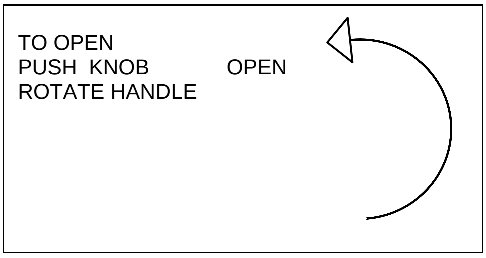
On the exterior left side of the fuselage adjacent to the crew entry door handle:



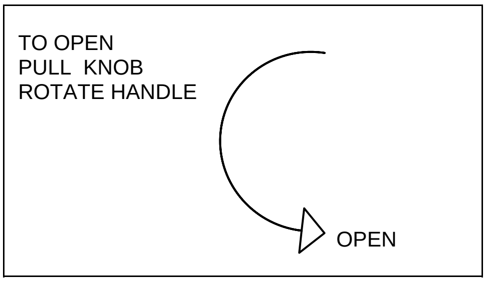
On the interior right side of the cockpit adjacent to the crew entry door handle:



On the interior left side of the cockpit adjacent to the crew entry door handle:



On the exterior right side of the fuselage adjacent to the crew entry door handle:



Adjacent to the elevator trim interrupt switch

ELEVATOR
TRIM
INTERRUPT

Below elevator trim interrupt switch

ISOLATE

Above elevator trim interrupt switch

NORMAL

Adjacent to the park brake lever

TO PARK:	DEPRESS PEDALS AND PULL KNOB, RELEASE PEDALS
TO UNPARK :	PUSH KNOB IN

On the fuel shut off valve lever:

PUSH ON FUEL PULL OFF

On the instrument panel in view of the pilot

SAFETY BELTS MUST BE
FASTENED AT ALL TIMES
WHILE IN FLIGHT

Adjacent to the fuel quantity indicators (placarded quantities may be in litres, pounds or gallons):

MAXIMUM USABLE FUEL TOTAL USABLE: 841 L
FRONT TANKS: 557 L REAR TANKS : 284 L

MAXIMUM FUEL IMBALANCE 100 LITRES

In the cargo compartment:

Applicable S/N 101 thru 102

ALL CARGO MUST BE ADEQUATELY TIED DOWN
MAXIMUM FLOOR LOADING/FT^2:136 LB/ FT^2
MAXIMUM AIRCRAFT TAKEOFF WEIGHT: 7500 LB
MAXIMUM LANDING WEIGHT: 7125 LBS

Applicable S/N 104 thru 999

ALL CARGO MUST BE ADEQUATELY TIED DOWN
MAXIMUM FLOOR LOADING/FT^2:171 LB/ FT^2
MAXIMUM AIRCRAFT TAKEOFF WEIGHT: 7500 LB
MAXIMUM LANDING WEIGHT: 7125 LBS

On the ITT indicator:

TRANST: 850^0C 2 SECS
START: 1090^0C MAX

On the torque indicator:

TRANSIENT TORQUE
PRESSURE LIMIT: 68.4 psi

Adjacent to the leading edge fuel tank filler cap:

LEADING EDGE TANKS
MUST BE FULL, BEFORE
FUELING REAR TANKS

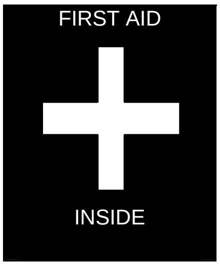
On the inside cover of the oil filler access panel (XXXX = the brand of oil used as per Figure 2.4)

USE ONLY
XXXX

Adjacent to each fuel tank filler cap:

JET FUEL
REFER TO A.F.M.
FOR APPROVED
FUELS

Adjacent to the first aid kit on the exterior of the aircraft, right hand side:



Adjacent to the fire extinguisher on the interior of the aircraft left of the pilot's seat:

Adjacent to the fire extinguisher on the exterior of the fuselage, left hand side:

On the exterior of the fuselage, both port and starboard side, 0.75 inch aft of Static Port:

STATIC PORT
DO NOT BLOCK

On the exterior of the fuselage adjacent to the main entrance, on the left hand side of the fuselage and on the cabin rear bulkhead, just in front of the ELT:

Adjacent to the axe on the exterior of the fuselage, right hand side:

Adjacent to the external power receptacle:

28V
DC

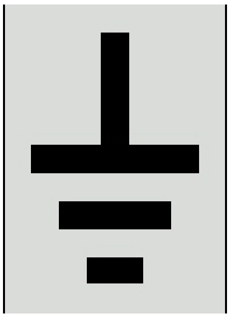
Adjacent to each crew exit on the interior:

EMERGENCY EXIT

Adjacent to each crew exit on the exterior:

EMERGENCY EXIT

Adjacent to earthing points:



On the noseleg:

TIRE PRESSURE 30 PSI

OLEO INFLATION 160 PSI

On each main landing gear:

TIRE PRESSURE 40 PSI

OLEO INFLATION 450 - 350 PSI

On the inside cabin wall between station 82 -115:

COMPARTMENT
STA 82 - 115
MAX LOAD 1200 LB

On the inside cabin wall between station 115 -166:

COMPARTMENT
STA 115 - 166
MAX LOAD 1200 LB

On the inside cabin wall between station 166 -240:

COMPARTMENT
STA 166 - 240
MAX LOAD 800 LB

Opposite the door on the inside cabin wall

FLOOR LOADING
STA 187 – 240
MAX LOAD 50 LB/ SQ.FT

On the compass:

FOR	N	30	60	E	120	150
STEER						
FOR	S	210	240	W	300	330
STEER						
DATE:					AIRPATH	

SECTION 3

EMERGENCY PROCEDURES

TABLE OF CONTENTS

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3.1 INTRODUCTION

Section 3 details the emergency checklist procedures for the airplane. Thorough pre flight planning and preparation and adherence to the normal checklist and operating procedures in conjunction with the appropriate airplane maintenance will assist the pilot to minimize exposure to airplane emergencies. The nature of emergencies may vary depending on the flight conditions and phase of flight. However, the basic checklist procedures should be considered in the event of an emergency or malfunction.

3.2 AIRSPEEDS FOR EMERGENCY OPERATIONS

ENGINE FAILURE AFTER TAKEOFF

Flaps Up:	95 KIAS
Flaps 20^0:	80 KIAS

(These speeds are based on an airplane weight of 7500 lbs but may be used at lesser weights)

MAXIMUM GLIDE SPEEDS

Maximum glide speed is the speed which will result in the greatest horizontal distance covered for a given height loss.

7500 lbs:	100 KIAS
6500 lbs:	93 KIAS
5500 lbs:	86 KIAS
4500 lbs:	78 KIAS

MANEUVERING SPEEDS

Maneuvering speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.

7500 lbs	131 KIAS
6500 lbs	122 KIAS
5500 lbs	112 KIAS
4500 lbs	101 KIAS

3.3 ENGINE FAILURE

ENGINE FAILURE DURING TAKEOFF

Power Lever	IDLE
Brakes	MAXIMUM BRAKING (or as appropriate to runway remaining)

If unable to stop on the remaining runway

Flaps	UP
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF
Fuel Shut Off Valve	OFF (disengage safety lock, pull lever fully out)
Radio	DISTRESS CALL
Battery Master	OFF
Generator Master	OFF

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

Airspeed	95 KIAS (with flaps up) 80 KIAS (with 20^0 flaps lowered)
Flaps	AS REQUIRED ($40^{0\ flap}$ recommended)
Power Lever	IDLE
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF
Fuel Shut Off Valve	OFF (disengage safety lock, pull lever fully out)
Battery Master	OFF
Generator Master	OFF

NOTE

If the propeller is not feathered following engine failure the rate of descent is significantly higher and 10 KIAS should be added to the normal approach speed to ensure adequate flare capability.

ENGINE FAILURE DURING FLIGHT

Airspeed	78-100 KIAS (Refer Section 3.2 for glide speeds)
Power Lever	IDLE
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF
Flaps	UP
Fuel Shut Off Valve	OFF (disengage safety lock, pull lever fully out)
Fuel Switch	OFF
Ignition Switch	AUTO
Forced Landing	Refer to Forced Landing Without Power checklist

3.4 AIRSTART

RESTART - if Ng is above 50% proceed as follows

Fuel Shut Off Valve	ON (push fully in, engage safety lock)
Fuel Condition Lever	FLIGHT IDLE (fully forward)
Power Lever	IDLE
Ignition Switch	CONT/CONTINUOUS, MONITOR - ITT and Ng for stabilized indications within normal flight limits
Power Lever	AS REQUIRED after satisfactory relight
Ignition Switch	AUTO (if the cause of the flameout has been corrected)

RESTART – if Ng is below 50% proceed as follows

AIR START STARTER ASSISTED

CAUTION

An engine restart should not be attempted if the engine failure was considered to be caused by mechanical failure.

Airspeed	78-100 KIAS (Refer Section 3.2 for glide speeds)
Power Lever	IDLE
Propeller Lever	MINIMUM RPM (within normal operating range)

CAUTION

A minimum of 15 psi oil pressure should be registered if the propeller is left unfeathered.

NOTE

If the propeller is not feathered following an engine failure the rate of descent is significantly higher and gliding range will be considerably reduced.

NOTE

Propeller feathering is not required if an immediate engine restart is considered appropriate. Propeller feathering is dependant on circumstances and at the discretion of the pilot.

Fuel Condition Lever	CUT OFF
Fuel Shut Off Valve	ON (pushed fully in and safety lock engaged)
Cabin Heater	OFF
Cockpit Heater	OFF
Windscreen Demist	OFF
Oil Cooler Heater	NORM/NORMAL
Inertial Separator (IPS)	NORM/NORMAL

Pitot Heat	ON
Instrument Lighting	AS REQUIRED
Jump Lights	OFF (If installed)
Map Light	OFF
Cabin Lighting	OFF
External Lighting	OFF
Avionics Master 2	OFF
Avionics Master 1	OFF
Ignition Switch	CONT/CONTINUOUS
Fuel Switch	MAN/MANUAL
Fuel Pressure	5 psi MINIMUM
Generator Master	OFF
Battery Master	ON
Start Switch	START and OBSERVE: - STARTER ENERGISED annunciator light illuminated - IGNITION ON annunciator light illuminated - Oil pressure indicating above zero
Fuel Condition Lever	GROUND IDLE (when Ng above 12%) and MONITOR: - ITT (1090ºC maximum, 2 second limit above 850ºC) - Ng accelerating
Start Switch	INTER/INTERRUPT - at 52% Ng (if auto starter cut out fails to disengage starter)
Fuel Condition Lever	FLIGHT IDLE
Propeller Lever	AS REQUIRED
Power Lever	AS REQUIRED
Generator Master	ON
Fuel Switch	AUTO (or MAN/MANUAL if cause of engine flameout is not known)

Ignition Switch	AUTO (or CONT/CONTINUOUS if cause of engine flameout is not known)
Avionics Master 1	ON
Avionics Master 2	ON
External Lighting	AS REQUIRED
Cabin Lighting	AS REQUIRED
Inertial Separator (IPS)	NORM/NORMAL (or BYPASS if cause of flameout is unknown or considered to be caused by ice, snow or moisture)
Oil Cooler Heater	AS REQUIRED
Cockpit Heater	AS REQUIRED
Cabin Heater	AS REQUIRED

AIR-START – NO STARTER

CAUTION

This procedure has not been evaluated by flight test and carries an increased risk of engine over temperature on start. An engine restart without the starter should only be attempted if the starter has failed.

CAUTION

An engine restart without the starter should not be attempted if the engine tachometer indicates zero Ng rpm. An engine restart without the starter may be attempted below 10% Ng but careful monitoring of the ITT is required.

CAUTION

If over temperature tendencies are encountered during an emergency air-start the fuel condition lever should be moved to the CUT OFF position periodically during acceleration to idle.

Altitude	Below 10,000 ft
Airspeed	100 KIAS MINIMUM (140 KIAS if propeller feathered)
Power Lever	IDLE
Propeller Lever	MAX RPM
Fuel Condition Lever	CUT OFF
Fuel Shut Off Valve	ON (push fully in, engage safety lock)
Battery Master	ON
Generator Master	OFF
Fuel Switch	MAN/MANUAL
Fuel Pressure	5 psi MINIMUM
Ignition Switch	CONT/CONTINUOUS
Avionics Master 1	OFF
Avionics Master 2	OFF
Inertial Separator	NORM/NORMAL
Ng	CHECK FOR ROTATION
Fuel Condition Lever	GROUND IDLE and MONITOR: - ITT (1090ºC maximum, 2 second limit above 850ºC) - Ng 52%

After stable Ng and ITT idle parameters are established

Fuel Condition Lever	FLIGHT IDLE
Propeller Lever	AS REQUIRED
Power Lever	AS REQUIRED
Generator Master	ON
Fuel Switch	AUTO (or MAN/MANUAL if cause of flameout is not known)
Ignition Switch	AUTO (or CONT/CONTINUOUS if cause of flameout is not known)

Avionics Master 1	ON
Avionics Master 2	ON
Inertial Separator (IPS)	NORM/NORMAL (or BYPASS if cause of flameout is unknown or considered to be caused by ice, snow or moisture)

3.5 SMOKE AND FIRE

ENGINE FIRE - DURING START

Fuel Condition Lever	CUT OFF
Start Switch	MOTOR FOR 30 SECONDS THEN OFF

If fire persists proceed as for **ENGINE AND FUSELAGE FIRE ON GROUND**

ENGINE AND FUSELAGE FIRE - ON GROUND

Power Lever	IDLE
Brakes	ON and PARKED
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF
Fuel Shut Off Valve	OFF (disengage safety lock, pull lever fully out)
Fuel Switch	OFF
Ignition Switch	OFF
Cockpit Air Vents	CLOSED
Cabin Air Vents	CLOSED
Cockpit Heater	OFF
Generator Master	OFF
Battery Master	OFF
Airplane	Evacuate passengers and crew to a safe area

ENGINE FIRE - IN FLIGHT

Airspeed	100 KIAS (with flaps up)
Flaps	UP
Power Lever	IDLE
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF
Fuel Shut Off Valve	OFF (disengage safety lock, pull lever fully out)
Cockpit Heater	OFF
Cockpit Air Vents	CLOSED
Cabin Air Vents	CLOSED
Fuel Switch	OFF
Ignition Switch	OFF
Forced Landing	Refer to Forced Landing Without Power checklist and use sideslip to keep flames clear of cockpit.

ELECTRICAL FIRE OR SMOKE IN FLIGHT

Fuselage or cockpit fires are likely to be the result of over heated electrical equipment and will usually be evidenced by smoke and a strong acrid smell.

Battery Master	OFF
Generator Master	OFF

WARNING

All electrically driven services will be unavailable with the GENERATOR MASTER and BATTERY MASTER switches selected OFF. These include the electrically powered gyro flight instruments, avionics, engine instruments, auxiliary fuel pump, annunciator lights, wing flaps and airplane lighting. Continued flight should be conducted with reference to serviceable pitot static instruments. If possible the airplane should be maneuvered to achieve and maintain visual meteorological conditions.

WARNING

If the GENERATOR MASTER is not switched OFF, all electrical services and devices that are switched ON, will still be supplied with electrical power.

Cockpit Heater	OFF
Cockpit Air Vents	OFF
Cabin Air Vents	OPEN
Fire Extinguisher	CONSIDER USE

WARNING

The extinguishing agent may cause irritation to the eyes and lungs. If installed, oxygen masks should be used until smoke and extinguishing agent clears.

Avionics Master 1	OFF
Avionics Master 2	OFF
Electrical Switches	OFF
Radio and Navigation Aid ON/OFF Knobs	OFF

CAUTION

If the fire goes out consider turning on only those electrical services necessary and essential to the safe conduct of the flight. If it cannot be visually verified that the fire has been completely extinguished land as soon as possible.

Battery Master	ON
Generator Master	ON
Circuit Breakers	CHECK for faulty circuit

CAUTION

Do not reset any popped circuit breakers

Avionics Master 1	ON
Avionics Master 2	ON
Radio and Navigation Aid ON/OFF Knobs	ON

NOTE

Turn each individual radio/navigation switch ON/OFF knob ON one by one and pause after selecting each knob ON to ensure the selected unit is not the cause of the electrical fire or smoke.

WING FIRE

Pitot Heat	OFF
Strobes/Navigation Lights	OFF
Landing Light	OFF

WARNING

Land as soon as possible using sideslip to keep the flames away from the fuel tanks and fuselage areas.

3.6 EMERGENCY DESCENT

ROUGH AIR

Harness and Seat Belts	TIGHT
Power Lever	IDLE
Propeller Lever	MAX RPM
Airspeed	140 KIAS (7500 lbs) 125 KIAS (6000 lbs) 108 KIAS (4500 lbs)

NOTE

The rate of descent may be increased by placing the airplane into a turn while maintaining the appropriate speed.

SMOOTH AIR

Harness and Seat Belts	TIGHT
Power Lever	IDLE
Propeller Lever	MAX RPM
Airspeed	170 KIAS

NOTE

The rate of descent may be increased by placing the airplane into a turn while maintaining the appropriate speed.

3.7 GLIDE

The airplane can glide a distance of 1.7 nautical miles per 1,000 ft of altitude lost, if the airplane is flown at a speed such that the optimum lift coefficient is maintained. The speed to fly for maximum glide is a function of weight. The recommended speeds are shown in Figure 3-1.

Weight (lbs)	Speed (KIAS)	Flaps
7,500	100	Up
6,500	93	Up
5,500	86	Up
4,500	78	Up

Figure 3-1, Recommended Glide Speeds

FORCED LANDING WITHOUT POWER

Airspeed	78-100 KIAS depending on weight (flaps up)
Power Lever	IDLE
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF
Flaps	UP
Fuel Shut Off Valve	OFF (disengage safety lock, pull lever fully out)
Landing Area	SELECT LANDING AREA (with regard to wind velocity, terrain and obstructions)
Approach	PLAN APPROACH (with regard to wind velocity and excess height in hand)
Radio	TRANSMIT MAYDAY CALL (on 121.5 MHz or monitoring ATC frequency)
Transponder	SQUAWK, AS REQUIRED
Harness	TIGHT
Fuel Switch	OFF
Ignition Switch	OFF
Flaps	AS REQUIRED for landing (40^0 recommended)
Generator Master	OFF
Battery Master	OFF (before landing and when complete with electrical services)
Vacate Airplane	WHEN AT A COMPLETE STOP

3.8 LANDING EMERGENCIES

PRECAUTIONARY LANDING WITH POWER

Harness	TIGHT
Flaps	20º
Airspeed	90 KIAS
Landing Area	SELECT LANDING AREA (over fly to assess wind direction, terrain and obstructions)
Approach	FLY NORMAL POWERED APPROACH
Flaps	AS REQUIRED (40^0 recommended)
Touchdown	TAIL LOW
Brakes	APPLY HEAVILY

LANDING WITH FLAT MAIN TIRE

Fuel	BURN OFF EXCESS FUEL (as practical to minimize landing weight.)
Approach	FLY A NORMAL APPROACH USING 40^0 FLAP
Wind Direction	CONSIDER PUTTING WIND ON THE SIDE OF THE SOUND TIRE
Landing	NOSE HIGH TOUCHING DOWN ON INFLATED TIRE FIRST (use aileron to hold the flat tire off as long as possible)
Heading	MAINTAIN DIRECTIONAL CONTROL WITH NOSE WHEEL STEERING AND BRAKES
Engine	SHUTDOWN AFTER TOUCHDOWN

LANDING WITH FLAT NOSE TIRE

Approach	FLY A NORMAL APPROACH USING 40^0 FLAP
Touchdown	HOLD NOSE WHEEL OFF AS LONG AS POSSIBLE
Brakes	CAUTIOUS APPLICATION OF BRAKES

DITCHING

Radio	TRANSMIT MAYDAY CALL (on 121.5 MHz or monitoring ATC frequency)
Transponder	SQUAWK, AS REQUIIRED
Loose Objects	SECURE
Harness	TIGHT
Flaps	40^0
Airspeed	80 KIAS
Power	MAINTAIN 300FT/MIN RATE OF DESCENT
Approach	High winds land INTO WIND Light winds/high swells LAND PARALLEL TO SWELLS

Touchdown	NOSE HIGH, MINIMUM RATE OF DESCENT, MINIMUM SPEED
Airplane	EVACUATE
Life Vest/Raft	INFLATE when clear of the airplane

WARNING

The ditching characteristics of the airplane is unknown.

3.9 ENGINE GEAR BOX CONTAMINATION

Amber CHIP DETECTOR annunciator light illuminated.

Engine Instruments	MONITOR for abnormal oil temperature, oil pressure or torque indications. Land at the nearest suitable location.

3.10 ENGINE DRIVEN PUMP FAILURE

Failure of the engine driven fuel pump will be indicated by illumination of the amber **FUEL PRESS LOW** light in the annunciator panel. With the fuel switch selected to AUTO the FUEL PRESS LOW light will only be illuminated for the period of time it takes for the auxiliary fuel pump to restore operating pressure. The auxiliary fuel pump will remain on which is indicated by illumination of the blue AUX FUEL PUMP ON light.

Fuel Switch	CHECK AUTO SELECTED. CHECK AUX FUEL PUMP ANNUNCIATOR LIGHT illuminated
Land	AS SOON AS PRACTICABLE

WARNING

Further flight should not be attempted until the fuel system fault has been established and rectified.

3.11 LOW FUEL LEVEL LIGHT ILLUMINATES

Fuel Contents Indicators -	CHECK CONTENTS, IF ZERO LAND AS SOON AS POSSIBLE AS THERE IS A MAXIMUM OF 24 LITRES (6.3 U.S. GALLONS, 42 LBS OF FUEL REMAINING). At a fuel flow of 180 litres per hour (47.5 U.S. gallons per hour or 316 pounds per hour) 24 litres (6.3 U.S. GALLONS, 42 LBS) remaining would give a maximum of 8 minutes engine running time.

WARNING

If the LOW FUEL LEVEL light illuminates and the fuel contents indicators confirm that there is no fuel in the tanks preparation should be made for a forced landing without power.

If fuel is still indicated in the fuel contents indicators it is probable that there is a problem with a jet pump/s. This could be due to either a blockage or a lack of motive pressure from the engine driven fuel pump.

Fuel Flow/Pressure Indicator	CHECK PRESSURE

If the pressure is below 12 psi it indicates that the engine driven fuel pump pressure is insufficient to provide the motive force for the jet pumps. Proceed as follows:

Fuel Switch	SELECT MAN/MANUAL, CHECK AUX FUEL PUMP ON light illuminated
Fuel Contents Indicators	CHECK FUEL TRANSFER FROM REAR TO FRONT TANKS
Land	LAND AS SOON AS PRACTICABLE, RECTIFY FAULT BEFORE FURTHER FLIGHT

If fuel pressure is normal proceed as follows:

Fuel Contents Indicators	FUEL IN FRONT TANKS WILL BE AVAILABLE, EXCLUDING 87 LITRES (22.9 U.S. gallons, 139 lbs) UNUSABLE IN THE LEFT TANK WHICH INCLUDES COLLECTOR TANK, AND 79 LITRES (20.8 U.S. gallons, 139 lbs) UNUSABLE IN THE RIGHT TANK.
Land	MAKE A DECISION TO DIVERT OR CONTINUE BASED ON USEABLE FUEL REMAINING IN FRONT TANKS

3.12 FUEL FILTER BYPASS

Illumination of the amber coloured FUEL FILTER BYPASS annunciator panel light indicates that the airframe fuel system fuel filter is being bypassed and unfiltered fuel is flowing to the engine fuel system. The bypass operates when the pressure differential across the inlet and outlet ports of the fuel filter is greater than 2.5 psi $\pm$ 0.2 psi.

Land	LAND AS SOON AS PRACTICABLE, RECTIFY FAULT BEFORE FURTHER FLIGHT

3.13 LOW OIL PRESSURE

Illumination of the OIL PRESS LOW light indicates that engine oil pressure has decreased below 25 psi. Land as soon as possible using power.

3.14 GENERATOR FAILURE

A failure of the generator will be indicated by illumination of the red GENERATOR OFF light in the annunciator panel.

Ammeter	CHECK, CONFIRM FAILURE
Generator Circuit Breaker	CHECK IN
Generator Master	RESET, then ON (only one attempt to reset)
Voltmeter	CHECK VOLTAGE LEVEL

If fault persists:

Generator Master	OFF
Non Essential Electrics	OFF
Land	AS SOON AS PRACTICABLE

3.15 BATTERY FAILURE

A battery failure may be detected by a temporary voltage drop evidenced by momentary dimming of instrument lights followed by a zero or unusually large charge reading on the ammeter.

Ammeter	CHECK
Battery Master	OFF
Non Essential Electrics	OFF

Gain and maintain visual meteorological conditions, land as soon as practicable

3.16 INADVERTENT OPENING OF AIRPLANE DOORS IN FLIGHT

RIGHT OR LEFT CREW DOORS

Speed	REDUCE TO BELOW 100 KIAS
Door	CLOSE

CARGO DOOR

The illumination of the red DOOR UNSAFE light in the annunciator panel indicates the cargo door is unlocked.

Speed	REDUCE TO BELOW 100 KIAS
Land	LAND AS SOON AS PRACTICABLE

3.17 ELEVATOR TRIM RUNAWAY

Trim Interrupt	ISOLATE
Speed	ADJUST to speed which results in acceptable control forces
Elevator Trim Manual Back Up	ENGAGE and trim airplane as required

3.18 SPIN

In the event that an unintentional spin occurs the following procedure should be applied;

Power Lever	IDLE
Rudder	APPLY FULL OPPOSITE TO DIRECTION OF TURN
Ailerons	NEUTRAL
Elevator	BRISKLY FORWARD TO BREAK THE STALL (full forward stick may be required at aft CG loadings)

When rotation stops centralise the rudder, roll wings level and recover from the dive.

WARNING

The pilot should make every endeavour to avoid flight parameters which are conducive to the development of a spin – crossed controls at low speeds.

NOTE

If disorientation makes it difficult to identify the direction of rotation, the needle of the turn and bank indicator should be used for this information.

3.19 AMPLIFIED PROCEDURES

It is impossible to detail emergency procedures to cover every eventuality so sound airmanship must always prevail. However, the checklist procedures will provide a sound basis upon which to handle airplane emergencies. The amplifying notes provide background information, which may assist the pilot in the event of an emergency.

The terminology "Land As Soon As Possible" and "Land As Soon As Practicable" is used in the checklist. "Land as Soon as Possible" means to land at the nearest available landing area with or without power. "Land As Soon As Practicable" means to land at the nearest available suitable airfield.

The success of coping with an in flight emergency relies on the pilot applying the basic airmanship principle of "fly the airplane" first and foremost.

WARNING AND CAUTION LIGHTS

The following table details the meaning of the annunciator panel lights:

LIGHT DESCRIPTION	COLOUR	MEANING	ACTIONS
Oil Press Low	RED	Engine oil pressure below 25 psi	Refer to Low Oil Pressure emergency checklist
Generator Off	RED	Generator off line	Proceed as for Generator Failure emergency checklist
Low Fuel Level	AMBER	(1) Check fuel contents, if indicating zero fuel there is a maximum of 24 litres (6.3 U.S. gallons, 42 lbs) of fuel remaining for flight. (2) Check fuel contents, if indicating that there is fuel in the tanks a fuel tank jet pump failure has occurred.	Refer Low Fuel Level Light Illuminates emergency checklist
Fuel Filter Bypass	AMBER	Airframe fuel filter has been bypassed	Refer to Fuel filter Bypass emergency checklist
Beta	BLUE	Propeller is set in beta range	Nil
Engine Anti-Ice	BLUE	Inertial separator door lowered	Vacate icing conditions
Door Unsafe	RED	Cargo door unlocked	Refer to Inadvertent Opening Of Airplane Doors In Flight emergency checklist
Chip Detector	AMBER	Engine reduction gearbox contamination	Refer to Engine Gear Box Contamination emergency checklist
Heater Hot	AMBER	The temperature sensor under the instrument panel has reached 100ºC	Shut off the heater. Pull the Diffuser Air fully ON. Pull the Cockpit Air control fully ON
Bus Fault	AMBER	Power failure to one of the two electrical buses.	Refer Electrical Bus Failure emergency checklist, Supplement 16.

LIGHT DESCRIPTION	COLOUR	MEANING	ACTIONS
Starter Energised	AMBER	Starter in operation	If light remains on after start and attaining 52% Ng select start interrupt.
Ignition On	BLUE	Igniters are operating	Deselect when finished using igniters
External Power	GREEN	External power connected	Ensure external power disconnected and light out prior to taxi
Pitot Heat Inoperative	AMBER	Pitot heat is either selected off, or if selected on the heating element in the pitot heat is defective.	Avoid moisture and icing conditions
Fuel Press Low	AMBER	Mechanical fuel pump pressure has decreased below 6 psi. Light will extinguish when pressure from the electric fuel pump increases system pressure to 9 psi.	Refer Engine Driven Pump Failure emergency checklist
Aux Fuel Pump On	BLUE	Electric fuel pump operating	Refer Engine Driven Pump Failure emergency checklist
Flap Fault	AMBER	The flap asymmetry switches have sensed a fault and isolated the flap motor.	No corrective action possible. Continue flight with flaps at failed position.

ENGINE FAILURE

GENERAL

The checklist procedures detail the actions to be taken in the event of an engine failure during various phases of flight. This includes basic details on airplane speeds and configurations.

If the engine fails during the takeoff roll the immediate priority is to stop the airplane on the remaining runway. Additional items in the checklist procedure are intended to provide additional safety following an engine failure. These items take on greater importance should an overrun of the runway appear likely.

The first priority in an engine failure immediately after takeoff is to preserve adequate airspeed to ensure that the rate of descent can be arrested in the landing flare. This will require the prompt lowering of the nose after engine failure, particularly from the steep climb out attitudes possible at light weights. ***(It is for this reason that unnecessarily steep climb attitudes immediately after takeoff are discouraged.)*** Ideally a landing area straight ahead should be used or at the most an area within 30^0 either side of the takeoff path. The altitude at the time of engine failure will ultimately determine how far the airplane is capable of gliding assuming the correct speed is maintained. Attempts to turn back to the runway should be resisted, as height and airspeed are seldom sufficient to safely complete the maneuver. As many of the checklist procedures as possible should be completed in the available time. In the event of a suspected engine failure care should be exercised not to shut down the engine unnecessarily.

NOTE

If the propeller is not feathered following engine failure the rate of descent is significantly higher and 10 knots should be added to the normal approach speed to ensure adequate flare capability.

NOTE

Feathering the propeller will significantly reduce the descent rate in the glide and improve gliding range.

For an engine failure in flight the priority is to establish the airplane in a glide at the recommended speed. The priority of tasks from this point will depend on several factors including the height above the terrain and whether the cause of the failure is obvious. However, in general the first priority should be selecting and planning an approach to a suitable landing area. Once this is completed the pilot could then attempt to diagnose the cause of the engine failure and attempt a restart if this is an option.

PARTIAL ENGINE FAILURES

Engine failures may result from a variety of causes and not all will result in a sudden or complete loss of power. Should a partial failure occur during the takeoff roll the takeoff should be discontinued and the airplane brought to an immediate stop. If beyond the point of stopping safely, or immediately after takeoff, the pilot may prefer to continue the takeoff. Such a decision will be at the pilot’s discretion and based on his/her assessment of the severity of the failure, and power loss, and the availability of emergency landing areas in the takeoff path. Following any significant engine malfunction, continued flight carries an increased risk of complete engine failure. The continued use of the engine should be limited to that necessary to make a safe emergency landing with the first priority being to “preserve life”.

DIAGNOSIS OF ENGINE FAILURE AND PARTIAL FAILURE

Effective and appropriate decision making following an engine failure is aided by a sound knowledge of the engine and systems. The diagnosis of an engine failure from engine instruments alone is not a simple task. The presence of noise or vibration and an awareness of environmental and engine operating conditions at time of failure may also provide valuable clues in the correct diagnosis of a malfunction. The following paragraphs offer some guidance as to what indications may be present for various modes of failure or engine malfunction.

COMPRESSOR SURGE / STALL

This is an unstable engine operating mode (possibly cause by bleed valve malfunction) often accompanied by an audible popping noise and in severe cases possible flameout. Instrument indications will likely include significant fluctuations in ITT and smaller fluctuations in torque. Ng and Np may appear quite stable. Reducing power to idle may be sufficient to allow the engine operation to stabilize and return to normal. If this is successful then power may be smoothly increased to some point below that at which the malfunction occurred and the flight continued. Engine compressor stall, to the degree of being audible, is not characteristic of normal engine operation and should be investigated.

FLAMEOUT

The symptoms of an engine flame-out will be the same as those of a total engine failure. A flameout will be noticed by a sudden and total loss of power and an associated drop in ITT, torque and Ng. A flameout may be the result of the engine running out of fuel, or possibly caused by unstable engine operation (compressor surge/ stall). Once the fuel supply has been restored and the cause of unstable operations eliminated the engine may be restarted in the manner described under air-starts.

TURBINE / COMPRESSOR BLADE FAILURE

The failure of a turbine or compressor blade may cause considerable downstream damage as it is ingested into the engine. However depending on the severity of the failure a total or sudden power loss may not be immediately obvious. An increase in engine vibration levels may be the most obvious indication. Instrument indications may show reduced readings on the torque and Ng indicators while ITT is increasing. Continued engine operation runs the risk of further engine damage and possible total failure. Ultimately the decision to shut down the damaged engine will be at the discretion of the pilot based on his/her assessment of the severity of the failure and the availability of suitable forced landing sights.

FCU FAILURE

A failure of the pneumatic or governor sections of the Fuel Control Unit (FCU) may cause the engine power to reduce to idle. Symptoms of this failure would be an ITT in the approximate range of 500ºC - 600ºC, a low torque reading of 0 – 10 psi, Ng of about 50% or higher and no response to power lever movement. No in-flight rectification action is possible. The idling engine will provide no useful thrust and the engine should be shut down and a forced landing without power carried out.

CAUTION

Do not attempt a restart if the engine failure is the result of obvious mechanical failure.

Following a total failure of the engine the loss of oil pressure should eventually cause the propeller to feather. However, prompt manual feathering by the pilot is encouraged as this will significantly reduce the rate of descent and improve gliding range should the propeller not feather automatically.

GLIDE

The pilot must be flexible in the approach to handling a forced landing without power as there will always be variations in the prevailing weather, height and airplane conditions. Success will largely depend on the ability of the pilot to modify the procedures to suit the conditions. Every effort must be made to avoid becoming engrossed with the airplane checks to the detriment of flying the airplane; therefore, it is important to learn, and remain aware of the priorities. **The aim of a forced landing is to save life**. If this can be done with minimal damage to property and without destroying the airplane so much the better.

PRECAUTIONARY LANDING WITH POWER

A forced landing is sometimes necessary for reasons other than engine failure. A forced landing with power requires careful planning and airplane control to afford the pilot with the best opportunity to complete a safe landing with the aim of preserving life. The approach and landing path should be inspected from a suitable low level with regard to wind and terrain. This will allow a better assessment of wind velocity and the landing areas surface, slope, size and approach and overshoot obstructions before committing to the landing.

As a rough guide to landing distance available note the time in seconds to fly the length of the intended landing area. At a ground speed of 100 knots the airplane will travel approximately 50 meters per second (54 yards per second).

GEAR BOX CONTAMINATION

Illumination of the CHIP DETECTOR light on the annunciator panel indicates that the magnetic plug in the engine reduction gear box has picked up some debris containing metal particles. Illumination of the CHIP DETECTOR light in itself does not indicate an imminent engine failure. The pilot should check the engine indicators for signs of any abnormal engine indications which indicate the CHIP DETECTOR light illumination is associated with significant engine deterioration. If the engine is in distress the pilot should consider a forced landing with power. If the pilot elects to continue the flight a forced landing without power is a possibility. If the CHIP DETECTOR light is not accompanied with any abnormal engine indications the pilot should consider a diversion to a suitable airfield and closely monitor the engine indicators for deterioration of the engine.

FUEL SYSTEM MALFUNCTIONS

Failure of the engine driven fuel pump will be indicated by illumination of the amber FUEL PRESS LOW light in the annunciator panel. The light will remain on until the electric auxiliary fuel pump delivers sufficient fuel pressure.

In the event of a failure of the primary (engine driven) fuel pump an electrically powered auxiliary fuel pump will automatically turn on provided the fuel pump switch is selected to the AUTO position. The functioning of the auxiliary fuel pump is indicated by a blue light on the annunciator panel.

The illumination of the LOW FUEL LEVEL is activated by a float switch in the collector tank and can indicate one of two scenarios.

1. Either the fuel contents in the fuel tanks has reduced to zero and the available usable fuel remaining comprises a maximum of the 24 litres (6.3 U.S. gallons, 42 lbs) in the collector tank.

2. Alternatively if fuel is still indicated on the contents indicator it is probable that a jet pump malfunction has occurred due to either a blockage or low motive pressure. A check of the fuel pressure on the fuel flow/pressure indicator will identify if the malfunction is a blockage or a low motive pressure situation.

A blockage of a jet pump/s will be indicated by normal fuel pressure on the fuel flow/pressure indicator. The fuel level in the collector tank will drop until it is the same level as the leading edge wing tanks and the tanks will continue to feed as one. Remaining fuel in the leading edge tanks is available for flight except for 87 litres (22.9 U.S. gallons, 153 lbs), includes collector tank contents, unusable in the front left tank, and 79 litres (20.8 U.S. gallons, 139 lbs) unusable in the front right tank. Fuel in the rear tanks will not be available. The pilot will need to make a decision on whether to continue or divert based on the useable fuel in the front tanks.

A low motive pressure situation will be indicated by a fuel pressure reading of less than 12 psi on the fuel flow/pressure indicator. Selecting the fuel switch to MAN/MANUAL will restore sufficient pressure to enable the normal operation of the fuel system. This will be indicated by transfer of fuel from the rear to front tanks as shown on the fuel contents indicators. The LOW FUEL LEVEL light should extinguish once the collector tank is full. The pilot should continue to monitor the normal transfer of fuel and land as soon as practicable.

LOSS OF OIL PRESSURE

The illumination of the LOW OIL PRESS light in the Annunciator panel and confirmation of loss of oil pressure on the oil pressure indicator indicates the engine will eventually seize and the propeller will move into feather. The length of time that the engine will operate with a confirmed loss of oil pressure will depend on several factors including engine condition and the power setting. The pilot may be able to prolong engine operation by reducing power to the minimum required for flight. If a loss of oil pressure is confirmed the pilot will need to decide whether to attempt to complete the flight, divert to a suitable airfield or complete a forced landing with power. If the pilot elects to continue flight the engine and propeller indications should be monitored closely for evidence of an impending failure.

GENERATOR FAILURE

Failure of the generator will be displayed by illumination of the GENERATOR OFF light in the Annunciator panel and the ammeter indicator showing a discharge. The generator master should be moved to the RESET position once in an attempt to bring the generator back on line. If the generator remains off line the airplane battery is the only source of power for the airplane electrical services. The ability of the battery to sustain electrical services will depend on the condition of the battery and the number of electrical services being run. Consequently, the pilot should turn off those electrical services that are not required for the safe continuance of flight.

BATTERY FAILURE

A battery failure with the generator operating normally does not pose any immediate problem for the pilot; however, the battery is the backup electrical supply in the event of the generator failing. A battery failure is detected by a temporary voltage decrease which will cause instrument lights to dim followed by a zero or very large charge current on the ammeter. A large charge current (75 amps and above) will indicate that the battery is consuming power but its fuses are still in tact. A zero charge current will indicate that the battery is disconnected due to blown battery fuses. If a battery failure occurs the pilot is to gain and maintain visual meteorological conditions as soon as practicable and land as soon as practicable. If it is not possible to gain and maintain visual meteorological conditions a diversion is to be made to the nearest suitable airfield.

LANDING WITHOUT ELEVATOR CONTROL

It is possible with a combination of power and elevator trim to control and land the airplane without the primary elevator control. Flight testing has shown that the use of elevator trim to pitch the airplane is slow and makes it difficult to precisely control pitch. Power is a much more precise and powerful generator of pitching moments i.e. an increase in power will generate a nose up pitching moment and a decrease in power will generate nose down pitch.

The airplane should be positioned on a long final approach to the intended landing area.

The approach may be flown with flaps retracted or in the takeoff (20^0) position. Landing flap (40^0) should not be used as pitch control is less precise. Flap configuration should not be changed within 1,000 ft of the ground.

The technique that works best is to use trim and power to establish a rate of descent of about 300 ft/min at 80 KIAS with the flaps in the takeoff (20^0) position or, 90 KIAS with the flaps retracted, then slowly add power to bring the nose up and rate of descent to zero in the landing flare.

INADVERTENT FLIGHT INTO ICING CONDITIONS

The airplane has not been tested for flight into icing conditions. Flight into forecast or known icing conditions is prohibited. The airplane is not equipped with any airframe, engine or propeller anti or deicing equipment. The airplane has a pitot heat, and an inertial separator to minimise the ingestion of ice into the engine in the event of inadvertent icing being encountered.

When encountering visible moisture below +5^0 C (41^{0}F) complete the following actions:

Pitot Heat	ON,
Ignition	CONT/CONTINUOUS
Inertial Separator (IPS)	BYPASS
Oil Cooler Heater	DEICE.

If inadvertent icing conditions are encountered the pilot should endeavour to fly the airplane clear of the icing conditions.

WARNING

Flight in forecast or known icing conditions is prohibited.

CAUTION

Engine icing can occur without airframe icing. Visible moisture is moisture in any form: clouds, ice crystals, snow, precipitation, or any combination of these.

Once clear of visible moisture and if further flight in visible moisture is not anticipated complete the following actions:

Inertial Separator (IPS)	NORMAL
Ignition	CONT/CONTINUOUS
Oil Cooler Heater	OFF

EMERGENCY EGRESS ON THE GROUND

When using the emergency exits adjacent to the pilot and front passenger seats it is suggested the pilot and occupant of the other front seat step from the seat, back on to the leading edge root extension on the wing and then walk back along the wing and step off the trailing edge of the wing.

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SECTION 4

NORMAL PROCEDURES

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4.1 INTRODUCTION

Section 4 details checklist procedures for normal operations.

4.2 AIRSPEEDS FOR NORMAL OPERATIONS

The following speeds are based on a maximum weight of 7500 lbs for takeoff and may be used for any lesser weight. Section 5 details the speeds required to achieve specific performance capabilities.

TAKEOFF

- Normal Climb Out Speed at 50 ft, Flaps 20^0 74 KIAS

CLIMB

- Best Rate of Climb Flaps 0^0 91 KIAS
- Best Angle of Climb Flaps 0^0 85 KIAS
- Best Angle of Climb Flaps 20^0 74 KIAS

LANDING APPROACH

- Normal Approach, Flaps 40^0 75 KIAS

BALKED LANDING

- Takeoff Power, Flaps 20^0 75 KIAS to flap retraction then 91 KIAS after flap fully up

MAXIMUM RECOMMENDED TURBULENT AIR PENETRATION SPEED

- Maximum Rough Air Speed 140 KIAS

MAXIMUM DEMONSTRATED CROSSWIND VELOCITY

- Takeoff or Landing 14 knots

4.3 PREFLIGHT INSPECTION

Pitot Heat Cover	REMOVE

CABIN

Door	OPEN, CHECK FREEDOM OF MOVEMENT
Pilot’s Operating Handbook,	STOWED BETWEEN PILOT AND FRONT PASSENGER SEATS
Axe, First Aid Kit	STOWED BETWEEN PILOT AND FRONT PASSENGER SEATS
Control Lock	REMOVE, STOW

Parking Brake	CHECK OPERATION OF TOE BRAKES AND PARK BRAKES
All Switches	OFF
All Circuit Breakers	IN
Air Conditioner (if installed)	OFF
Fuel Shut Off Valve	ON (lever pushed fully in, safety lock engaged)
Battery Master Switch	ON
Volt/Ammeter	SET TO VOLTS – CHECK 24V MINIMUM. IF LESS THAN 24V USE EXTERNAL POWER FOR START
Fuel Quantity Indicators	CHECK QUANTITY
Flaps	40^0 (fully down)
Lighting	CHECK EXTERNAL AND INTERNAL LIGHTING AS REQUIRED FOR DAY/NIGHT FLYING
Pitot Heat	ON FOR 30 SECONDS, OFF
Battery Master Switch	OFF
Fire Extinguisher	FITTED, SECURE, SEAL UNBROKEN

LEFT WING

Upper and Lower	CHECK SURFACE CONDITION
Flap	CHECK ALIGNMENT, BONDING AND CONDITION
Aileron	CHECK FULL AND FREE MOVEMENT, SECURITY OF TABS AND BONDING WIRES
Wing Tip	CHECK CONDITION OF FAIRING
Navigation and Strobe Light	CHECK CONDITION AND CHECK LENS CLEAN
Landing Light	CHECK CONDITION AND CHECK LENS CLEAN
Leading Edge	CHECK CONDITION
Fuel Drains	CHECK FUEL IN FRONT, REAR AND SUMP TANKS FREE OF WATER AND SEDIMENT, CHECK DRAINS CLOSED
Fuel Vent	CHECK FREE OF OBSTRUCTIONS

Left Main Landing Gear	INSPECT, CHECK TIRE INFLATION AND CONDITION, CHECK BRAKE LINES FOR SECURITY AND ABSENCE OF LEAKS AND CHECK OLEO INFLATION
Fuel Filler Caps	OPEN, REMOVE CAPS, CHECK CONTENTS VISUALLY FOR DESIRED LEVEL, REPLACE CAPS AND CHECK CAPS FOR PROPER SEALING AND SECURITY

WARNING

Failure to properly seat and secure the fuel filler caps will result in fuel leaking overboard.

COCKPIT AND CABIN - LEFTHAND SIDE

Windows	CHECK FOR CRACKS AND CLEANLINESS
Crew Entry Door	CHECK CONDITION

ENGINE

Engine	CHECK NO LEAKS, NO DAMAGE AND CHECK SECURITY OF ENGINE
Cowls	CHECK FOR SECURITY
Exhaust Pipe	REMOVE COVERS, CHECK SECURITY AND CONDITION
Ducts	CHECK FREE OF OBSTRUCTIONS
Air Intake	REMOVE COVER AND CHECK FREE OF OBSTRUCTIONS AND FOREIGN MATERIAL

WARNING

Obstructions and or foreign material in the air intake could result in damage to the engine and eventual engine stoppage.

Oil Contents	CHECK LEVEL SUFFICIENT FOR FLIGHT AND ENSURE CAP SECURED AND LOCKED

WARNING

Failure to secure the dipstick cap in the correct manner will result in the loss of oil and eventual engine stoppage.

WARNING

Operating the engine with less than the recommended oil will result in engine stoppage.

PROPELLER

Propeller	ROTATE MANUALLY TO ENSURE FREEDOM OF MOVEMENT, CHECK NO OIL LEAKS, CHECK BLADES FREE OF DAMAGE
Spinner	CHECK SECURITY AND CONDITION

NOSE LANDING GEAR

Landing Gear	INSPECT, CHECK TIRE INFLATION AND CONDITION, AND CHECK OLEO INFLATION
Oil Breather Line	CHECK FREE OF OBSTRUCTIONS
Accessory Gear Box Drains	CHECK FREE OF OBSTRUCTIONS AND NO OIL DRAINING FROM VENTS
Fuel Filter Drain	DRAIN AND CHECK FUEL TO ENSURE IT IS FREE OF CONTAMINATION, ENSURE DRAIN CLOSED
Environmental Fuel Can Drain	DRAIN FUEL

COCKPIT AND CABIN - RIGHTHAND SIDE

Windows	CHECK FOR CRACKS AND CLEANLINESS
Crew Entry Door	CHECK CONDITION

RIGHT WING

Upper and Lower	CHECK SURFACE CONDITION
Leading Edge	CHECK CONDITION

Fuel Drains	CHECK FUEL IN FRONT AND SUMP TANKS FREE OF WATER AND SEDIMENT, CHECK DRAINS CLOSED
Fuel Vent	CHECK FREE OF OBSTRUCTIONS
Right Main Landing Gear	INSPECT, CHECK TIRE INFLATION AND CONDITION, CHECK BRAKE LINES FOR SECURITY AND ABSENCE OF LEAKS AND CHECK OLEO INFLATION
Fuel Filler Caps	OPEN, REMOVE CAPS, CHECK CONTENTS VISUALLY FOR DESIRED LEVEL, REPLACE CAPS AND CHECK CAPS FOR PROPER SEALING AND SECURITY
Stall Warning	CHECK DEFLECTION
Landing Light	CHECK CONDITION AND CHECK LENS CLEAN
Wing Tip	CHECK FAIRING CONDITION
Navigation and Strobe Light	CHECK CONDITION AND CHECK LENS CLEAN
Pitot Head	CHECK UNOBSTRUCTED, CHECK FOR WARMTH
Aileron	CHECK FULL AND FREE MOVEMENT, SECURITY OF TABS AND BONDING WIRES
Flap	CHECK ALIGNMENT, BONDING, CONDITION

REAR FUSELAGE

VHF, GPS, ELT Antenna	CHECK CONDITION
Fuselage Skin	CHECK CONDITION
Static Vent	CHECK FREE OF OBSTRUCTION
Dorsal Fin	INSPECT
Ventral Fin	INSPECT
Tailplane	INSPECT, CHECK ELEVATOR FULL AND FREE MOVEMENT, CHECK BONDING WIRES
Tailcone and Bumper	CHECK
Navigation Light	CHECK CONDITION AND CHECK LENS CLEAN
Fin and Rudder	CHECK CONDITION
External Power	CHECK COVER CLOSED IF EXTERNAL POWER NOT IN USE
Static Vent	CHECK FREE OF OBSTRUCTION

4.4 BEFORE ENGINE STARTING

Pre Flight Inspection	COMPLETE
Weight and Balance	COMPLETE
Passenger Briefing	COMPLETE
Cabin Door	CLOSED AND LOCKED
Harness	FITTED, ADJUSTED AND TIGHT
Flight Controls	FULL AND FREE MOVEMENT IN THE CORRECT SENSE
Lighting Dimmers	OFF
Fuel Shut Off Valve	ON (pushed fully in and safety lock engaged)
Parking Brake	ON
Power Lever	CHECK TRAVEL, BETA STOP FREE OPERATION AND ACTION OF FRICTION DAMPER

CAUTION

Do not move the power lever back into the beta range with the engine not running, as damage to the control linkages will occur.

Propeller Lever	CHECK TRAVEL, FREE OPERATION AND ACTION OF FRICTION DAMPER
Fuel Condition Lever	CHECK TRAVEL, FREE OPERATION AND ACTION OF FRICTION DAMPER
Flap Lever	UP POSITION
Control Friction	ADJUSTED
Battery Master Switch	ON
Generator Master Switch	OFF
Fuel Switch	AUTO
Ignition Switch	AUTO
Start Switch	OFF
Avionics Master Switch 1	OFF
Avionics Master Switch 2	OFF

Navigation Lights	AS REQUIRED
Landing Lights	OFF
Strobe Lights	OFF
Cabin Lights	AS REQUIRED
Map Lights	AS REQUIRED
Jump Light	OFF
Instrument Lights	AS REQUIRED
Pitot Heat	OFF
Inertial Separator (IPS)	NORM/NORMAL
Oil Cooler Heater	NORM/NORMAL
Windscreen Demister	OFF
Circuit Breakers (Left Panel)	CHECK IN
Governor Overspeed Test Button	CHECK CONDITION
Warning and Caution Panel	PRESS TO TEST (ensure all lights operating, release) SET TO DAY / NIGHT AS REQUIRED
Annunciator Lights	CHECK (confirm illuminated lights correctly verify airplane status)
Pilot’s Flight Instruments	CHECK CONDITION
Engine Instruments	CHECK CONDITION
Fuel Flow/Pressure Indicator	CHECK CONDITION, (programme fuel contents, select AUX/PRESS)
Fuel Contents Indicator Front	CHECK LEFT & RIGHT, SUFFICIENT FOR PROPOSED FLIGHT
Fuel Contents Indicator Rear	CHECK LEFT & RIGHT, SUFFICIENT FOR PROPOSED FLIGHT
OAT Indicator	CONDITION
ELT	ARMED
Intercom	CHECKED AND SET
Radios and Nav Aids	CHECK CONDITION,
Transponder	CHECK

Trim/ Flap Position Indicators	CHECK CONDITION
Voltmeter/Ammeter	CHECK, SET TO VOLTS (24 V Minimum)
Co-Pilot Flight Instruments	CHECK CONDITION
Circuit Breakers (Right Panel)	CHECK IN
Crew Entry Doors	CLOSED AND LOCKED

4.5 USE OF EXTERNAL POWER

Battery Master Switch	OFF
External Power Supply	CONNECT TO EXTERNAL RECEPTACLE ON RIGHT REAR FUSELAGE, TURN EXTERNAL POWER ON
Battery Master Switch	ON, CHECK VOLTMETER MINIMUM 24 V

Continue with Engine Starting checklist

4.6 ENGINE STARTING

(Normal Procedure – Internal Battery and External Power Supply Start)

Pre Flight and Pre Start Checks	COMPLETED
Power Lever	IDLE
Propeller Lever	FEATHER
Fuel Condition Lever	CUT OFF

CAUTION

Ensure the fuel condition lever is in the CUT OFF position (fully aft) before start otherwise an over temperature condition will result during engine start.

Area	CLEAR
Start Switch	SELECT START (for 1 second then release)
Fuel Condition Lever	AT 13 – 15% Ng MOVE FUEL CONDITION LEVER FORWARD TO GROUND IDLE POSITION.

CAUTION

If ITT increases rapidly towards 1090^{0}C be prepared to return the fuel condition lever to CUT OFF.

CAUTION

Do not exceed the starter time limits detailed in Section 2 Limitations.

CAUTION

If the engine fails to start within 10 seconds after moving the fuel condition lever to the GROUND IDLE position move the fuel condition lever to the CUT OFF position. Allow a 30 second fuel draining period followed by a 15 second dry motoring run before attempting another start.

CAUTION

If for any reason a start is discontinued, allow the engine to come to a complete stop and then complete a dry motoring run.

CAUTION

After completing a dry motoring run ensure the entire starting sequence is completed.

STARTER ENERGISED Light	CHECK OFF
AUX FUEL PUMP Light	CHECK OFF
IGNITION Light	CHECK OFF
Oil Pressure	CHECK 40 PSI MINIMUM
ITT	INDICATING, CHECK WITHIN LIMITS
Oil Temperature	CHECK WITHIN LIMITS
External Power	DISCONNECT (if used)
Propeller Lever	FULLY FORWARD Np CHECK 52-54%
Generator Master Switch	ON, CHECK CHARGING, AMPS DECREASING

4.7 DRY MOTORING RUN

Before Engine Starting Checks	COMPLETE
Ignition Switch	OFF
Start Switch	SELECT START (for 1 second then release)
Start Switch	SELECT OFF (after 30 seconds)

4.8 BEFORE TAXIING

Avionics Master Switch 1	ON
Avionics Master Switch 2	ON
Radios and Nav aids	ON
Flaps	CHECK NORMAL OPERATION AND RETRACT
Inertial Separator (IPS)	CHECK OPERATION, SELECT “BYPASS” CHECK “ENGINE ANTI ICE/BYPASS” ANNUNCIATOR LIGHT ON. RETURN TO “NORMAL/NORM” IF NOT REQUIRED. LEAVE IN “BYPASS” IF THERE IS A POSSIBILITY OF INGESTING FOREIGN MATERIAL INTO THE ENGINE

4.9 TAXIING

Parking Brake	RELEASE BRAKES
Brakes	CHECK OPERATION
Flight Instruments	CHECK

CAUTION

Avoid operating the rudder pedals whilst the airplane is stationary. Heavy loads applied to the nose wheel steering mechanism result in undue wear to the attachment and pivot point.

CAUTION

During taxi operations particular care and attention should be given to propeller tip clearance particularly when operating on unimproved or irregular surfaces.

NOTE

Propeller beta range may be used during taxi but to prevent propeller blade damage care should be exercised in areas where there is loose material on the ground.

4.10 BEFORE TAKEOFF

Trims	SET TAKEOFF POSITION (Elevator: forward CG heavy weight trim position – lower end of green range; aft CG heavy weight trim position – upper end of green range; trim positions for intermediary weights and CG – set relative to maximum weights and CG. Aileron: set neutral. Rudder: set neutral.
Propeller	FEATHER, THEN FULLY FORWARD MAX RPM (allow propeller to go to feather position then check the propeller unfeathers when Propeller Lever selected fully forward)
Flap	SET POSITION REQUIRED FOR TAKEOFF POSITION, 20^0 RECOMMENDED FOR NORMAL OPERATION
Fuel	VALVE ON SAFETY LOCK ENGAGED, FUEL SWITCH AUTO, COMPUTER PROGRAMMED, CONTENTS SUFFICIENT FOR FLIGHT, PRESSURE IN LIMITS, FUEL ANNUNICATOR LIGHTS EXTINGUISHED

Engine Instruments	TEMPERATURES AND PRESSURE WITHIN LIMITS
Flight Instruments	ALTIMETER SET, ARTIFICIAL HORIZON SET, DIRECTIONAL GYRO SET
Avionics	RADIOS AND NAVIGATION EQUIPMENT ON AND SET
Pitot Heat	ON, “PITOT HEAT INOPERATIVE” ANNUNICATOR LIGHT EXTINGUISHED
Lighting	STROBE, NAVIGATION AND LANDING LIGHTS AS REQUIRED
Inertial Separator (IPS)	NORM/NORMAL OR BYPASS AS REQUIRED (refer Section 5 for increased takeoff distance with BYPASS selected)
Annunciator Lights	ALL EXTINGUISHED
Doors	CLOSED, LOCKED AND SECURE, DOOR UNSAFE LIGHT OFF
Harness	SEATS, SEAT BELTS AND SHOULDER HARNESS ADJUSTED AND SECURE
Flight Controls	AILERON AND ELEVATOR FULL, FREE AND CORRECT MOVEMENT
Pre Takeoff Brief	COMPLETE

4.11 NORMAL TAKEOFF

The Normal Takeoff technique is the technique used to derive the takeoff performance data in Section 5.

Lined Up On Runway	CHECK COMPASSES COMPARE WITH RUNWAY HEADING
Fuel Condition Lever	FLIGHT IDLE (fully forward)
Brakes	APPLY FOOT BRAKES AND HOLD
Governor Overspeed	Set 73% Np (1606 RPM) with Power Lever, push and hold Governor Overspeed Test Button, move Power Lever forward to set 84% ± 1% (1848 RPM ± 22). Np should not exceed 85% (1870 RPM), set 73% with Power Lever, release Governor Overspeed Test Button (first flight of the day only)
Power Lever	SMOOTHLY ADVANCE POWER LEVER TO TAKE OFF POWER, OBSERVE ITT AND ENGINE LIMITS
Engine Instruments	CHECK ENGINE SETTINGS WITHIN LIMITS

Brakes	RELEASE
Rotation	61 KIAS (refer to Section 5 for speeds at reduced weights)
Initial Climb	74 KIAS UNTIL CLEAR OF OBSTACLES (refer to Section 5 for speeds at reduced weights)
Clear of Obstacles	Accelerate to 91 KIAS (refer to Section 5 for speeds at reduced weights)
Flaps	RETRACT to 0^0 AT SAFE HEIGHT

4.12 SHORT FIELD TAKEOFF

Refer to the Normal Takeoff procedures in Section 4.11. The Normal Takeoff technique is also the Short Field Takeoff technique. The takeoff performance data in Section 5 was derived using the takeoff technique detailed in the Normal Takeoff procedures in Section 4.11.

4.13 CLIMB

Flaps	RETRACT WHEN SAFELY AIRBORNE AND CLEAR OF OBSTACLES
Engine Instruments	CHECK TEMPERATURES AND PRESSURE WITHIN LIMITS

NOTES

Refer to Section 2 for engine limitations.

When operating at altitudes at or above 16,000 ft in high temperature conditions (ISA +30^{0}C) the fuel switch should be selected to MANUAL/MAN to minimize the possibility of cavitation of the engine driven fuel pump. The fuel switch should be selected to AUTO once the altitude reduces below 16,000 ft or when the ambient temperature has reduced below ISA + 30^{0}C.

Landing Lights	AS REQUIRED
Climb Speed	91 KIAS

4.14 MAXIMUM PERFORMANCE CLIMB

Flaps	RETRACTED
Airspeed	Best angle of climb Vx 85 KIAS Best rate of climb Vy 91 KIAS
Propeller Lever	MAX RPM

Power Lever	64 psi torque (5 min. limit) 54 psi torque (MCP)
Engine Instruments	MONITOR TEMPERATURES AND PRESSURE

NOTES

Refer to Section 2 for engine limitations.

When operating at altitudes at or above 16,000 ft in high temperature conditions (ISA +30^{0}C) the fuel switch should be selected to MANUAL/MAN to minimize the possibility of cavitation of the engine driven fuel pump. The fuel switch should be selected to AUTO once the altitude reduces below 16,000 ft or when the ambient temperature has reduced below ISA + 30^{0}C.

4.15 CRUISE

Cruise Power	SET AS REQUIRED, (refer cruise power tables in Section 5)
Engine Instruments	MONITOR TEMPERATURES AND PRESSURES

NOTES

Refer to Section 2 for engine limitations.

When operating at altitudes at or above 16,000 ft in high temperature conditions (ISA +30^{0}C) the fuel switch should be selected to MANUAL/MAN to minimize the possibility of cavitation of the engine driven fuel pump. The fuel switch should be selected to AUTO once the altitude reduces below 16,000 ft or when the ambient temperature has reduced below ISA + 30^{0}C.

4.16 DESCENT

Altimeter	SET
Power Lever	SET REQUIRED POWER FOR RATE OF DESCENT

4.17 BEFORE LANDING

Power Lever	AS REQUIRED
Propeller Lever	MAX RPM
Fuel Condition Lever	FLIGHT IDLE (fully forward)
Flaps	AS REQUIRED
Harness	TIGHT

Landing Light	AS REQUIRED
Brakes	OFF

4.18 NORMAL LANDING

The following landing technique, with maximum braking, was the technique used to achieve the landing performance data in Section 5.

Flaps	SELECT FULL FLAP, 40^0
Speed	75 KIAS (refer to Section 5 for speeds at reduced weights)
Landing	MAIN WHEELS FIRST
Power Lever	IDLE STOP – (refer Section 5 for landing performance using beta and reverse)
Brakes	APPLY BRAKING AS REQUIRED WHILE HOLDING STICK AFT

4.19 SHORT FIELD LANDING

Refer to the Normal Landing procedures in Section 4.18. The Normal Landing technique is also the Short Field Landing technique. The landing performance data in Section 5 was derived using the landing technique detailed in the Normal Landing procedures in Section 4.18.

4.20 BALKED LANDING

Power Lever	SET TAKE OFF POWER
Flaps	RETRACT to 20º
Climb Speed	75 KIAS minimum until clear of obstacles
Clear of Obstacles	ACCELERATE TO 91 KIAS
Flaps	RETRACT TO 0^0 AT A SAFE HEIGHT

4.21 AFTER LANDING

Flaps	RETRACT
Landing Lights	OFF
Pitot Heat	OFF
Fuel Condition Lever	GROUND IDLE

4.22 SHUT-DOWN

Inertial Separator (IPS)	NORM/NORMAL
Power Lever	IDLE
Parking Brake	PARK
Propeller Lever	FEATHER
VHF Radio	SELECT -121.5MHz, listen for ELT audio signal in headset when listening out on 121.5MHz. If ELT is transmitting check airplane ELT is turned OFF.
Fuel Condition Lever	CUT-OFF (after minimum of one minute with power lever at idle) CHECK FOR ITT DECREASE
Windscreen Demister	OFF
Oil Cooler Heater	NORM/NORMAL
Instrument Lights	OFF
Jump Light	OFF
Map Light	OFF
Cabin Lights	OFF
Strobe Lights	OFF
Landing Lights	OFF
Navigation Lights	OFF
Avionics Master Switch 2	OFF
Avionics Master Switch 1	OFF
Start Switch	OFF
Ignition Switch	OFF
Fuel Switch	OFF
Generator Master Switch	OFF
Battery Master Switch	OFF
Fuel Shut Off Valve	OFF (disengage safety lock and pull lever fully out)
Control Lock	FITTED

CAUTION

On engine shutdown observe ITT and Ng indications to observe immediate fuel cut off. If immediate fuel cut off not evident close the fuel valve.

NOTE

Engine should not be shut down with the power lever in reverse or damage to the propeller link will result

Doors	CLOSED
Wheel Chocks	IN PLACE
Pitot Head Cover	FITTED
Exhaust Covers	FITTED
Air Inlet Cover	FITTTED

4.23 POSTFLIGHT ELT

VHF Radio	SELECT -121.5MHz, listen for ELT audio signal in headset when listening out on 121.5MHz. If ELT is transmitting check airplane ELT is turned OFF.

4.24 ENVIRONMENTAL SYSTEMS

VENTILATION

Cockpit air vents on the lower left and right sides of the instrument panel incorporate swivelling vanes to allow the flow of cooling air to be directed as required. The flow of air is controlled by pull handles mounted immediately left and right of the engine control quadrant. The push/pull controls are pull for on and push for off.

4.25 NOISE CHARACTERISTICS

With ever growing public concern for improving our environment it is the responsibility of all pilots to minimize the effect of airplane noise on the public.

The certificated noise level for the airplane established in accordance with FAR 36 Appendix G is 86.9 dB(A) and 86.8 dB(A) in accordance with ICAO Annex 16 Chapter 10 (through Amendment 7). No determination has been made by the Civil Aviation Authority of New Zealand or Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, or out of, any airport.

As responsible pilots it is possible to demonstrate concern for the environment by following these suggested procedures;

1. Pilots operating VFR over densely populated areas, public gatherings, parks or other noise sensitive areas should make every effort to fly at not less than 2000 ft above the surface when weather and air traffic clearances permit.

2. During departure maintain climb at 74 knots with maximum takeoff power until passing 300 ft above the ground after which the flaps should be retracted and the climb continued at 91 knots (best rate of climb speed). Passing 1500 ft above the ground the power should be adjusted set to maximum continuous power setting for continued climb.

3. During cruise and approach to the airport the use of reduced propeller rpm will significantly reduce noise. The arrival should be planned to minimise prolonged operations at low level. Passing about 1500 ft above the ground the propeller rpm should be returned to maximum, as the before landing checklist is completed.

4. After landing avoid excessive or unnecessary use of beta and reverse thrust and set the fuel condition lever to GROUND IDLE for taxi.

NOTE

The above noise abatement procedures do not apply where they would conflict with air traffic clearances or instructions, or when, in the pilot's judgement, they would compromise the orderly flow of traffic and safe flight conduct.

4.26 FUEL CONSERVATION

The key to fuel conservation is effective planning. Section 5 provides the necessary planning material to plan the flight profile which best suits the intended task.

It is the pilot's responsibility to ensure that adequate fuel is loaded to ensure the safe completion of the mission while maintaining, adequate reserves after intended landing, and such additional fuel as is considered necessary to deal with possible in-flight contingencies or diversions. The carriage of fuel significantly in excess of mission requirements will incur an unnecessary weight and performance penalty and limits the revenue earning payload which could otherwise be carried.

If normal turnaround times permit it is generally more economical to refuel between flights rather than tanking fuel for subsequent flights. Consideration should be given to fuel costs at out ports and other operational factors such as engine cycle limits otherwise savings in fuel consumption may be at the expense of other operating costs.

The performance tables and graphs in Section 5 should be used to determine the climb and cruise fuel requirements for the intended mission. At high weights and/or high ambient temperatures a lower than normal cruising level may be warranted as the gains usually achieved at the high cruise will be eroded with the prolonged climb. This effect is most significant on short sectors.

The benefits of reduced fuel flow at higher altitude are often countered by strong headwinds that increase with altitude. If headwinds are encountered at altitude consideration should be given to cruising at a lower altitude. In headwinds fly at higher than the still-air best range speed. The increase in specific fuel consumption, at speeds slightly above best range speed, is small and will be offset by the reduced time spent in the headwind.

As the airplane is un-pressurised the descent should be planned to allow sufficient time for passengers to equalise the pressure in their ears. Commence descent at a point which will avoid unnecessary manoeuvring overhead the destination airfield.

The descent should be flown at reduced power and close to the rough air penetration speed, in case turbulence is encountered on descent. A descent at high power and high speed is not recommended as it will compromise both fuel efficiency and passenger comfort.

All ground manoeuvring should be done with the fuel condition lever in the GROUND IDLE position.

4.27 AMPLIFIED PROCEDURES

PREFLIGHT INSPECTION

Thorough and effective preparation is essential for the safety and overall success of every flight. A pre-flight inspection is an essential part of any preparation for flight. Ultimately the pilot must ensure the airplane is safe for flight. During the pre-flight inspection careful attention is required to the specific checklist details described in Section 4 of this handbook.

It is beneficial to take a “long range” view of the airplane when first approached to check for any obvious irregularities which may not be so obvious at close range such as the attitude that the airplane is sitting or whether there are any damp patches under the airplane indicating fuel and or oil leaks.

A careful check of the general condition of the airplane should be made at all times, particularly if the airplane is parked exposed to the weather elements or has not been flown for extended periods.

The presence of dents and damage to the airplane skins, landing gear or propeller may indicate previously unreported damage and should be checked by an engineer before flight.

Fuel checks must be carried out before flight and after each refuel. Sufficient fuel should be drained from each of the 6 fuel drains (2 in each wing, 1 sump tank and fuel filter drain). If appreciable amounts of water are present it is possible that the fluid removed may comprise only water and may be mistaken as fuel. Ensure the fuel sample taken from each drain contains fuel and that it is free of water, dust, sand, and other contamination. If the fuel sample contains any water or contamination further samples must be taken until a fuel sample is clear of such contamination. The fuel environmental tank should also be emptied.

A visual fuel check of the fuel tank contents is an integral part of the fuel management process. The pilot should reconcile the visual and dipped contents of the fuel tanks with the gauges and determine whether sufficient fuel exists for the planned flight with appropriate reserves.

The oil level of the engine is best checked within 10 minutes of engine shutdown; however, a check with a completely cold engine is acceptable. Refer to Section 8 for the correct method of determining an appropriate oil level for the airplane.

Particular attention should be paid to ensuring that the engine air intake is free of all obstructions and foreign material. Objects or foreign material of any kind in the air intake could disrupt the air flow into the engine and or enter the engine and cause damage to the engine or engine stoppage.

BEFORE ENGINE STARTING

The pilot is responsible for the correct loading of the airplane and the completion of the weight and balance calculations.

CAUTION

The pilot must complete an accurate weight and balance calculation and ensure the airplane is loaded within the approved weight and balance limits prior to flight. Failure to do so could result in the loss of life and the airplane.

Completion of the before engine starting checklist should be adhered to, to ensure the airplane is configured for a successful engine start.

A description of the annunciator panel lights and appropriate actions should one illuminate is contained in Section 3.19 of the handbook.

The ignition switch is a 3 position switch labelled CONT/CONTINUOUS, OFF and AUTO. It should be set to the AUTO position for a normal ground start. The igniters are energised when the starter switch is selected to on. The igniters stop operating when the start cycle is complete.

The avionics master switch should be left off during the start to ensure that no electrical load "spikes" cause damage to the radios and navigation equipment.

It is essential that the power lever is set at the idle stop and the fuel condition lever at the CUT OFF position prior to the start.

CAUTION

Excessive engine temperatures will result if a start is attempted with the power lever forward of the idle stop and or fuel condition lever forward of the cut off position.

ENGINE STARTING

Before starting the engine ensure the before engine starting checklist is completed and that the area around the airplane, particularly in front of the airplane is clear of any obstructions, loose debris and people.

The start sequence is initiated by selecting the start switch ON. The engine will accelerate as noted on the Ng. There will be an audible sound of the engine spooling up and the igniters may be heard and the propeller will begin to rotate. When the Ng reaches 12-15% move the fuel condition lever to the GROUND IDLE position. If the start is normal, within 10 seconds of moving the fuel condition lever to ground idle there should be an audible combustion as the engine accelerates smoothly. When the Ng reaches approximately 30-35% there will be a momentary reduction in engine acceleration until the secondary nozzles take effect at which stage the engine will continue to accelerate to idle of approximately 52% Ng. At this stage the ITT should peak and reduce. During the start closely monitor the ITT so that any unusually high ITT are noticed early. The maximum ITT for start is 1090^0C for no more than 2 seconds.

CAUTION

Abort the start if ITT does not begin to increase within 10 seconds of moving the fuel condition lever to the GROUND IDLE position.

CAUTION

Move the fuel condition lever to CUT OFF if ITT is likely to exceed 1090^0***C.***

It is important to start the engine in the correct manner otherwise an abnormal start could result causing damage to the engine. The presence of too much fuel (incorrect engine control positions) or a low battery voltage could lead to excessive temperatures during start.

The start cycle should be stopped immediately anything unusual is detected. As an example, if the fuel has been scheduled and it is noted that the fuel shut off valve is closed the start cycle should be stopped rather than opening the fuel shut off valve. If the igniters are noted as being off during the start cycle do not turn them on and attempt to continue the start. A start is aborted by returning the fuel condition lever to the CUT OFF position and then selecting the starter switch to the INTER/INTERRUPT position.

A dry motoring run must be completed following any unsuccessful start. This will purge the engine of any un-burnt fuel and prevent a hot start on the subsequent start attempt.

Successful engine starts can be accomplished using internal batteries and well maintained external batteries. The minimum indicated voltage for the airplane internal start is 24 V. The use of external batteries is recommended if the airplane battery charge level is low or suspect. A poor battery will manifest itself with slow engine acceleration during the initial start sequence and a hotter start. A slow engine acceleration should be stopped by moving the fuel condition lever to CUT OFF and then selecting the starter switch to the INTER/INTERRUPT position.
.

CAUTION

Do not attempt a start if battery voltage is less than 24 V.

DRY MOTORING RUN

The dry motoring run procedure is used to clear the engine of any unburnt fuel or vapour which may have resulted from an unsuccessful start.

Fuel Condition Lever	CUT OFF
Ignition Switch	OFF
Battery Master Switch	ON
Fuel Shut Off Valve	OPEN (pushed fully in and safety lock engaged)
Starter Switch	START - for 30 seconds then select INTER/INTERRUPT

CAUTION

The fuel shut off valve should be closed if an engine fire is evident.

CAUTION

Do not exceed the starter limits detailed in Section 2 for a dry motoring run.

CAUTION

If the engine is motored to extinguish a fire continue to motor the engine until the ITT decreases.

Do not attempt a further start if the engine suffered an engine fire until the engine is checked by an appropriately qualified engineer. Do not attempt a further start after a dry motoring run until the appropriate starter cooling period is observed as detailed in Section 2.

IGNITION PROCEDURES

The airplane is equipped with an ignition switch which has 3 positions. The AUTO position is used for normal operations. In this position the igniters are controlled by the start switch.

The CONT/CONTINUOUS position is used for conditions where continuous ignition is recommended. In the following conditions it is recommended that the ignition switch is selected to CONT/CONTINUOUS:

Operations in visible moisture when the temperature is below +5^{0}C (41^{0}F) both in the air and on the ground

Operations in heavy precipitation both in the air and on the ground

Operations requiring the use of contaminated (eg, surface water, snow) runway surfaces

Inflight engine starts without starter

If the LOW FUEL LEVEL light illuminates and the fuel contents indicators confirm fuel starvation is likely.

CAUTION

Engine icing can occur without airframe icing. Visible moisture is moisture in any form: clouds, ice crystals, snow, precipitation, or any combination of these.

The third position is OFF.

INERTIAL SEPARATOR

An inertial separator is fitted in the engine inlet duct. The purpose of the inertial separator (IPS), when selected to BYPASS is to minimise the possibility of ingesting undesirable material into the engine such as ice, snow, dust and sand. The inertial separator (IPS) , when selected to BYPASS, creates an airflow path which makes it difficult for solid particles to follow and they are directed overboard. Use of the inertial separator is permitted for all phases of flight including takeoff and landing.

The inertial separator (IPS) when in BYPASS does not allow the most efficient flow of air into the engine so there is some performance degradation. Refer to Section 5 for performance data with inertial separator (IPS) selected to BYPASS.

It is recommended that the inertial particle separator (IPS) is selected to the BYPASS position in the following conditions:

When airplane operations require the use of contaminated runway surfaces (eg, surface water, snow).

When encountering visible moisture below +5^{0}C (41^{0}F).

At night when freedom from visible moisture is not assured below +5ºC (41^{0}F) .

CAUTION

Engine icing can occur without airframe icing. Visible moisture is moisture in any form: clouds, ice crystals, snow, precipitation, or any combination of these.

TAXIING

To minimise brake wear the use of beta is recommended as a means of controlling taxi speeds; however, the use of beta should be avoided if there is loose material on the ground such as sand and stones as these could damage the propeller.

CAUTION

The use of beta when taxiing across surfaces with loose material will result in damage to the propeller.

Care should be taken when taxiing with the wind direction off the nose of the airplane.

CAUTION

The incorrect positioning of the flight controls could lead to the airplane sustaining damage.

With the airplane taxiing at low speed or parked out of wind a vibration may be felt. This is due to the wind affect on the flow through the propeller. The vibration can be reduced by parking the airplane directly into wind.

When airplane operations require the use of contaminated ground or taxiway surfaces (eg, surface water, sand, dust and snow) consideration should be given to selecting the inertial separator (IPS) to BYPASS.

BEFORE TAKEOFF

The thorough completion of the before takeoff checklist is an essential procedure in the pre flight preparation.

When lowering the wing flaps it is recommended that the pilot visually check the flap position to ensure that it relates to the position on the flap indicator.

The airplane fuel system is uncomplicated with only one fuel shutoff valve to control the fuel from all wing tanks to the engine. There are no tank selectors. The fuel shut off valve remains in the on position (pushed fully in and safety lock engaged) at all times during normal operations. The electric fuel pump remains in the AUTO position so that in the event that the engine driven fuel pump fails the electric fuel pump should automatically switch on. Refer Section 3 for a detailed explanation of fuel pump emergencies.

The inertial separator system should be functionally checked periodically if normal operations do not require its regular use. Within 30 seconds of selecting BYPASS on the selector switch (IPS) the blue ENGINE ANTI ICE/BYPASS annunciator light should illuminate to indicate that the air intake deflector and aft bypass outlet have completed the movement to their bypass positions. Following a selection back to the NORM/NORMAL position the blue annunciator light will extinguish within a few seconds although the complete cycle back to the normal configuration will not be complete for up to 30 seconds.

When airplane operations require the use of contaminated runway surfaces (eg, surface water, sand, dust and snow) consideration should be given to selecting the inertial separator (IPS) to BYPASS. At night when freedom from visible moisture cannot be assured below +5ºC (41ºF) select the BYPASS position on the inertial particle separator (IPS) switch.

NORMAL TAKEOFF

A wing flap setting of 20^0 is recommended for all takeoffs. 20^0 flap will provide the best takeoff performance. The Normal Takeoff technique is to be used for Short Field operations and is the technique used to derive the performance data in Section 5.

Ensure that the maximum runway length is available for takeoff and that the nose wheel is straight. After lining up on the runway, and prior to takeoff the fuel condition lever is set at the flight idle position to ensure optimum engine acceleration. The power lever is advanced smoothly to the takeoff torque setting while holding the airplane stationary using the wheel brakes. The control column should be progressively moved rearwards as power is applied to ensure adequate propeller clearance. When takeoff power is confirmed release the brakes. Maintain an elevator position of near neutral with the stick until near rotate speed. On soft unpaved takeoff surfaces aft stick may be used to reduce rolling resistance from the wheels. Rotate the airplane at 61 KIAS and climb at 74 KIAS with flap 20^0 to 50 ft or clear of obstacles. When clear of the obstacles accelerate to 91 KIAS and retract the flaps to 0^0. Refer to Section 5 for takeoff speeds at weights less than 7500 lbs.

SHORT FIELD TAKE OFF

The Normal Takeoff technique is to be used for Short Field operations and is the technique used to derive the performance data in Section 5.

CROSSWIND TAKEOFF

20^0 of flap is recommended for crosswind takeoffs. The crosswind takeoff technique differs from the normal takeoff in that the nose wheel should be held on the ground to the rotate point. In addition, into wind aileron should be applied to prevent the wing lifting. Rotation should be positive ensuring the airplane wheels separate from the ground at the same time. Once the airplane is airborne it should be weather cocked into wind to restore balanced flight, and to track the runway centre line.

CRUISE

Refer to Section 5 for cruise performance data. During cruise the pilot should monitor engine instruments to ensure that temperatures and pressures remain within the specified limits as detailed in Section 2.

Complete the following actions when encountering visible moisture below +5^0 C (41^{0}F) or snow and at night when freedom from visible moisture cannot be assured below +5ºC.

Pitot Heat	ON,
Ignition	CONT
Inertial Separator (IPS)	BYPASS
Oil Cooler Heater	DEICE.

If inadvertent icing conditions are encountered the pilot should endeavour to fly the airplane clear of the icing conditions.

WARNING

Flight in forecast or known icing conditions is prohibited.

CAUTION

Engine icing can occur without airframe icing. Visible moisture is moisture in any form: clouds, ice crystals, snow, precipitation, or any combination of these.

Once clear of visible moisture and if further flight in visible moisture is not anticipated complete the following actions:

Inertial Separator (IPS)	NORMAL
Ignition	OFF
Oil Cooler Heater	OFF

The fuel system is designed to feed evenly from all tanks. During flight fuel feed should be monitored to check for any fuel imbalance. Flight should not continue if a fuel imbalance of more than 100 litres (26.4 U.S. gallons) exists.

IFR OPERATIONS

The airplane is a Category A IFR airplane. The airplane is capable of being operated in the speed ranges applicable to Category A airplanes. The configurations and speeds for takeoff, climb, cruise and descent detailed in preceding paragraphs of the POH/AFM are applicable to IFR operations. On an instrument approach final approach segment it is recommended the airplane is configured with 20^0 flap and power to maintain the instrument approach profile. Flap should be selected to 40^0 before landing.

Some propeller settings cause the indicators on the course deviation bar to oscillate. Maintain propeller rpm above 1850 rpm (84%) on VOR, localizer and ILS approaches to minimize the likelihood of oscillations on the course deviation bar.

NOTE

Increase propeller rpm if oscillations are observed on the course deviation bar.

STALLS

The airplane stall characteristics are conventional. As speed approaches the stall speed the flying controls, while effective, are less responsive. In normal flight and loading conditions an audible stall warning horn will sound at least 5 knots prior to the stall.

NORMAL LANDING

The normal landing technique is also the technique to be used for short field landings. Landings require accurate speed and approach path control. This requires the airplane to be configured in sufficient time to allow the required parameters to be set and maintained. The aim of a landing is to arrive at the touchdown point at the selected airspeed. The approach should be flown with 40^0 flap and power to maintain the approach path. An approach angle of about 3º should be flown. Airspeed should be maintained at 75 KIAS in a powered approach until a height of 50 ft and then power gradually reduced to allow a speed decay, while maintaining the approach angle, to arrive at the touchdown point just above stall speed of 58 KIAS with power at idle. Flare to land main wheels first and apply wheel braking as required without skidding the tires. Maximum braking is required, if the landing distance performance tabled in Section 5 is required. Further reduction in landing distance of about 10% can be achieved with the use of beta and reverse thrust after touchdown. During the ground roll and after the nose wheel is firmly on the ground ensure the control column is held fully aft to assist maximum wheel braking and to maximize propeller clearance.

The touchdown should be accomplished on the main wheels and then the nose wheel slowly lowered on to the ground.

After landing set the fuel condition lever to the GROUND IDLE position.

SHORT FIELD LANDING

Refer to the normal landing technique which is also the short field landing technique.

CROSSWIND LANDING

There are two recognised techniques for final approach to a crosswind landing, the wing down technique and the crab technique. It is suggested that a combination of both techniques be used comprising the crab technique to short final and then smoothly transitioning to the wing down technique for the touchdown. In strong or gusty wind conditions the introduction of crossed controls should be delayed as the airplane remains more responsive to the controls when flown in balance using the crabbed approach. Up to 10 knots may be added to the normal approach speed for more positive control if the landing distance permits. It is recommended that 40^0 flap is used. Once on the ground maintain directional control with nose wheel steering and ensure that into-wind aileron is applied to prevent the into-wind wing lifting. Forward pressure on the stick will improve nose wheel steering, particularly when loaded at an aft CG. Avoid large or abrupt power changes in the landing flare or aggressive use of beta after touchdown as this will make directional control more difficult.

BALKED LANDING

The balked landing should be initiated with the simultaneous application of takeoff power while applying rudder to maintain balance and setting the climb attitude. The flap should be raised to

20^0 and the initial climb flown at 75 KIAS. Fully retract the flap once established in the climb and when clear of obstacles.

NO FLAP LANDING

If required to land without flap add 8 to 13 knots to the approach speed (8 knots at 4000 lbs and 13 knots at 7,125 lbs. The required landing distance will increase by 25% for a given weight without flaps on asphalt. If landing on dry grass the required landing roll distance will increase by a further 15%. Use of reverse thrust may reduce landing roll distance on a dry asphalt runway by 5%.

AFTER LANDING

After landing turn off any electrical, radio, navigation and lighting equipment which is not required for the taxi to the engine shutdown point. The fuel condition lever should also be set to GROUND IDLE.

AFTER SHUTDOWN

After engine shutdown has been completed ensure that all switches are turned off. If the airplane is going to be left unattended and or there is any wind the control locks should be fitted to prevent the flying controls moving in the wind. The air intake cover and exhaust covers should be fitted and the propeller tie down secured. These measures will prevent foreign objects getting into the engine and the propeller condition deteriorating due to the lack of lubrication. A careful examination of the airplane after flight should be completed to ensure any obvious damage or defects are reported to the relevant engineers so that action is initiated prior to the next flight.

ENGINE HANDLING

The efficiency and life of the engine will be enhanced with careful engine handling during all operations. The rate of movement of the power lever should always be smooth and advanced in unison with engine acceleration. The rate of engine acceleration is not directly proportional to the rate of movement of the power lever. Care taken to avoid prolonged or transient operations at near maximum temperature limits will enhance engine life and reliability while reducing overhaul costs.

SECTION 5

PERFORMANCE

TABLE OF CONTENTS

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5.1 INTRODUCTION

The performance charts and tables in this section provide the necessary planning information so the pilot may know, with reasonable accuracy, what to expect from the airplane in various conditions. The data in the charts has been computed from flight tests using average piloting techniques and using an airplane and engine in good condition.

WARNING

To ensure that published performance figures can be duplicated, the airplane and engine must be maintained in good condition. Pilot proficiency and thorough preflight planning for all phases of flight are necessary to assure performance predictions are achieved with adequate margins of safety.

Notes have been provided on various charts and tables which indicate the approximate effects on performance when the inertial separator is in the BYPASS position. The actual effect will vary depending on temperature, altitude and airspeed. At lower altitudes the effect will be less as the engine's performance margins may allow torque recovery with power lever advance within other normal engine limitations. Refer to Section 2 for details on engine operating limits.

Reserve fuel referred to in the range and endurance sections is computed as 45 minutes at the best range power setting for the altitude used for the flight. Factors such as engine and propeller condition and turbulence may produce variations in range and endurance of 10% or more. Accurate fuel management requires the regular in-flight monitoring of the fuel contents and consumption as well as an awareness of environmental and operational factors to ensure that safe fuel reserves are maintained.

USE OF PERFORMANCE CHARTS

Performance charts and tables are organized in logical sequence and follow the normal flight progression from takeoff – climb – cruise – descent – landing. Where appropriate, instructions and worked examples are included in the introduction to each sub section. As a further guide the following paragraphs work through to performance planning for a sample flight.

SAMPLE FLIGHT PLANNING PROBLEM

Airplane Configuration

Takeoff Weight	7500 lbs
Useable Fuel	1459 lbs (829 litres)

Takeoff Conditions

Airfield Pressure Altitude	1250 ft
Temperature	20ºC (ISA +7ºC)
Wind Component	12 knot headwind
Field Length	3500 ft

Cruise

Total Distance	450 nm
Pressure Altitude	11,500 ft
Temperature	+2ºC (ISA +10ºC)
Wind En-route	10 knot headwind

Landing Conditions

Airfield Pressure Altitude	2000 ft
Temperature	20ºC (ISA +9ºC)
Field Length	3500 ft

TAKEOFF

The takeoff distance is calculated from the table shown in Figure 5-7. Figure 5-7 details takeoff distances for operations with a centre of gravity between the forward limit and 118.99" aft of datum. It should be noted that these distances are based on the short field takeoff technique detailed in Section 4. When actual conditions do not correspond exactly with table conditions, conservative planning figures can be established by reading the chart at the next higher value of weight, altitude or temperature, as appropriate. For example, in the sample conditions presented above, the takeoff distance information presented for a weight of 7500 lbs with a centre of gravity at 118.00" aft of the datum, pressure altitude of 2000 ft and temperature of ISA +10ºC, should be used. This results in the following takeoff distances:

Ground Roll	1470 ft
Total To Clear 50 ft Obstacle	1996 ft

These figures are well within the field length available. Note 2 from the takeoff table in Figure 5-7 indicates that a correction for the effects of headwind should be made. The correction is as follows:

$$\frac{12\text{ kt}}{5\text{ kt}} \times 7\% = 16\ \%\text{ decrease.}$$

This results in the following distances, adjusted for wind:

Ground Roll Zero Wind	1470 ft
Decrease In Ground Roll (1470 X 16%)	236 ft
Corrected Ground Roll	1234 ft
Total Distance To Clear A 50 ft Obstacle	1996 ft
Decrease In Total Distance (1996 X 16%)	320 ft
Corrected Total Distance	1676 ft

CRUISE

The selection of cruising altitude should be based on a consideration of airplane climb capability (at the operating weight), cruise sector length, and winds at altitude, as well as any applicable minimum safe altitude and air traffic requirements. There is further discussion on the selection of cruise speed and altitude under the heading of "Fuel Conservation" later in this section.

With forecast headwinds aloft the sample flight is planned at a high cruise power setting. Studying the tables for 10,000 ft and 15,000 ft in Figure 5-11 it is evident that the higher torque value of 52 psi at 10,000 ft with 91.2% Np is not attainable at 15,000 ft with 91.2% Np. As planned cruise is above 10,000 ft the next figure down (45 psi) is used. A comparison of these two altitudes also shows that the lower altitude provides the more conservative fuel flow and true airspeed figures for planning.

The table for 10,000 ft pressure altitude is used and in the 91.2% Np band the torque of 45 psi is selected. Forecast temperature aloft is 10ºC above standard (ISA +10ºC). The true airspeed and fuel flow figures, presented for ISA and ISA +20ºC are as follows;

ISA			ISA +20ºC		
KTAS	LPH	(pph)	KTAS	LPH	(pph)
156	192	(338)	161	195	(344)

Interpolating between the respective true airspeed and fuel flow values it can be established that the ISA + 10ºC figures are approximately:

True Airspeed	158 KTAS	
Cruise Fuel Flow	194 LPH	(342 pph)

Fuel Required

The total fuel requirements for the planned flight are established by adding the following:

Start, Taxi and Takeoff Fuel	-	22 litres, (39 lbs)
Climb Fuel	-	(from Figure 5-9)
Cruise Fuel	-	(cruise fuel flow x time spent at cruise)
Descent Fuel	-	(from Figure 5-11)
Holding Or Contingency Fuel	-	(as appropriate due to weather and operation requirements)
Reserve Fuel	-	(45 minutes at cruise fuel flow)

Note

If prolonged taxi or holding delays are anticipated prior to takeoff the standard allowance of 40 lbs should be increased appropriately.

Assuming a maximum rate climb, Figure 5-10 is used to determine the time, distance and fuel used to climb to cruise altitude. The table figures are based on a climb from sea level. For climbs initiated above sea level the difference between the values shown at cruise and departure altitudes may be used. The departure airfield in the sample problem is at 1250 ft with a temperature of ISA + 7ºC. Conservative figures can be determined by using the figures based on a climb from sea level in ISA +10ºC conditions.

This results in the following:

Time	13 minutes
Distance	22 nm
Fuel used	49 litres (87 lbs)

Similarly, Figure 5-12 is used to determine the time, distance and fuel for a descent from cruise altitude. Using the figures for a descent from 12,000 ft (nearest to planned cruise of 11,500 ft), to sea level, the following values are established:

Time	15 minutes
Distance	40 nm
Fuel used	39 litres (69 lbs)

The distances shown on the climb and descent tables are for zero wind conditions. The correction for wind is made as follows:

Climb Distance in Zero Wind	22 nm
Decrease in Distance Due to Wind	
(13 min/60 X 10 knots headwind)	2 nm
Corrected Distance to Climb	20 nm

A similar correction is made to the descent distance as follows:

Descent Distance in Zero Wind	40 nm
Decrease in Distance Due To Wind	
(15 min/60 X 10 knots headwind)	≅ 3 nm
Corrected Distance to Descend	37 nm

The cruise distance is then determined by subtracting the distance for climb and descent from the total distance.

Total Distance	450 nm
Distance During Climb And Descent	-57 nm
Cruise Distance	393 nm

With a forecast headwind of 10 knots the expected groundspeed is expected to be:

True Airspeed In Cruise	158 KTAS
Wind Component	-10 knots
Ground Speed	148 knots

Therefore, the time required to complete the cruise portion of the flight is:

$$\frac{393 \text{ nm}}{148 \text{ kts}} = 2.66 \text{ hours}$$

The fuel required for the cruise portion of the flight is:

2.66 hours X 194 LPH (342 pph) = 517 litres (910 lbs)

The 45 minute reserve fuel is calculated as follows:

$$\frac{45}{60} \text{ X 194 LPH (342 pph)} = 146 \text{ litres (257 lbs)}$$

Assuming no additional holding or contingency fuel is required to satisfy air traffic, weather or operational requirements, the total fuel required is estimated as follows:

Start, Taxi and Takeoff Fuel	22 litres (39 lbs)
Climb	49 litres (87 lbs)
Cruise	517 litres (910 lbs)
Descent	39 litres (69 lbs)
Reserve	146 litres (257 lbs)
Total Fuel Required For Fight	773 litres (1362 lbs)

The above figure is a planning estimate only. In flight monitoring of groundspeed and fuel flow is essential to establish a basis for accurate fuel management and to ensure that adequate reserves of fuel are maintained for the safe completion of the flight.

LANDING

The method used to determine landing distance from Figure 5-15 is similar to that used for takeoff calculations. The landing weight must be estimated as follows:

Takeoff Weight	7500 lbs
Fuel Required For Takeoff, Climb, Cruise and Descent	1105 lbs (627 litres)
Landing Weight	6395 lbs

This is below the maximum allowable landing weight of 7,125 lbs.

The landing distances shown in Figure 5-15 assume a short landing technique as defined in Section 4. The one table is valid for all landing weights and using the figures for a landing at 2,000 ft pressure altitude, in ISA + 10ºC conditions, the following distances are determined:

Total Distance Over A 50 ft Obstacle	2172 ft
Ground Roll	915 ft

These figures are well within the field length available. Note 2, from Figure 5-15, indicates that a correction for the effects of headwind may also be made. If such a correction was considered necessary, due to limited field length available, the correction should be made using the same method that applies to the takeoff distance.

FUEL CONSERVATION

Familiarity with this section and thorough planning will optimize fuel conservation and ensure efficient airplane operations. Of particular interest are the climb, cruise, descent, range and endurance sections.

The selection of a cruising altitude should be guided by an awareness of the reducing fuel flow and increasing true airspeed as altitude increases. These figures are available from the cruise tables. At high weights the degraded climb performance may warrant a lower cruising altitude to avoid prolonged time in a low speed climb. Short flight sectors may also warrant a slightly lower cruising altitude, to minimize the time penalty of a long climb with insufficient cruise time to achieve an economy gain. Route minimum safe altitude or air traffic requirements must also be adhered to.

As the airplane is un-pressurized, the descent should be planned to allow sufficient time for passengers to equalize the pressure in their ears. Commence descent at a point which will avoid unnecessary maneuvering overhead the destination airfield. The descent table provides figures based on a constant 800 fpm descent rate. For passengers comfort it may be necessary to reduce the descent rate to about 500 fpm, particularly at altitudes below 10,000 ft. If this is anticipated the descent should be initiated slightly earlier to avoid delays overhead the destination.

The descent should be flown at reduced power, and close to the rough air penetration speed, in case turbulence is encountered on descent. A descent at high power and high speed is not recommended as it will compromise both fuel efficiency and passenger comfort.

When extreme range, rather than flight time, is the principle requirement the range profile should be used as shown in Figure 5-13. It demonstrates that increasing altitude will generally improve range. A reduction from maximum cruising speed will also benefit range, within limits. The effects of headwind and tailwind may vary predictions to a considerable degree. As a general principle the range speed should be increased in a headwind and reduced in a tailwind.

When required to hold at a particular position the fuel consumption will be minimum when flying at minimum power speed. Below 15,000 ft the best endurance speed is 90 knots. If absolute maximum endurance is not essential, a practical holding airspeed is 100 KIAS. The economy gains from further speed reduction are minimal and at this speed airplane handling is more comfortable with a safe margin above the stall. Endurance flight times are greatest below 10,000 ft as can be seen from the endurance profile shown in Figure 5-14.

5.2 AIRSPEED CALIBRATION

NORMAL STATIC SYSTEM

CONDITIONS

Weight: 7,500 lbs

Power: For level flight or maximum power for descent.

NOTE

Airspeed values which would fall below the stalling speed for the configuration or are above the approved maximum operating speed have been replaced with dashed lines.

Flaps Up								
KIAS	---	80	100	120	140	160	170	---
KCAS	---	82	102	121	141	161	171	---
Flaps 20º								
KIAS	60	70	80	90	100	110	120	130
KCAS	62	72	81	91	100	110	119	128
Flaps 40º								
KIAS	50	60	70	80	90	100	110	120
KCAS	52	61	71	80	89	99	108	117

Figure 5-1, Airspeed Calibration

5.3 ALTIMETER CORRECTION

NORMAL STATIC SYSTEM

CONDITIONS

Weight: 7,500 lbs

Power: For level flight or maximum power for descent.

NOTE

Where values have been replaced by dashed lines the correction is not necessary as the condition is not attainable in level flight or is outside of approved operating limits.

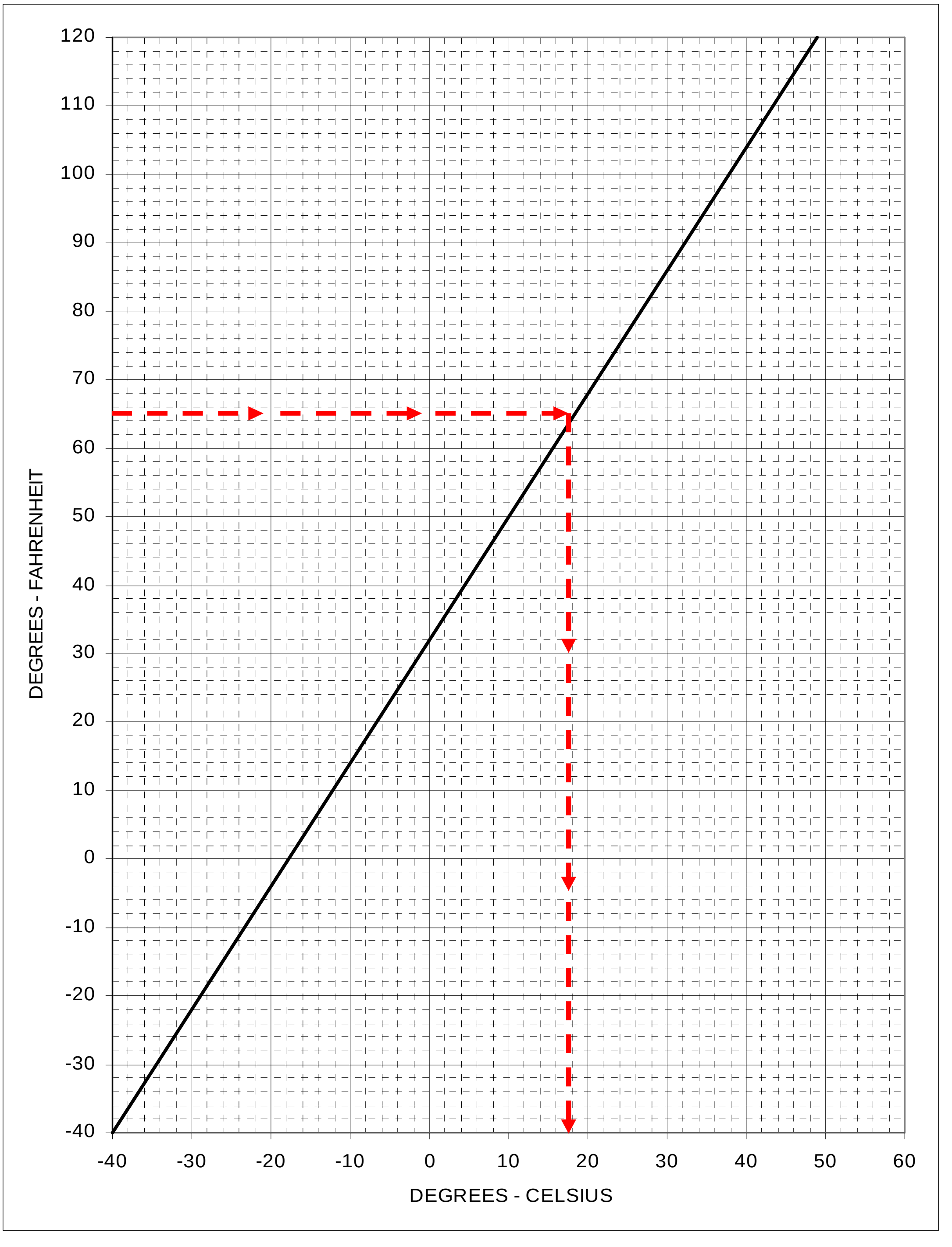
Add correction to desired altitude to obtain indicated altitude to fly.

Condition	**Correction to be added – feet**							
	KIAS							
Flaps Up	60	70	80	100	120	140	155	170
	---	-20	-15	-15	-10	-10	-15	-15
	KIAS							
Flaps 20º	60	70	80	90	100	110	120	130
	-15	-10	-5	0	0	5	10	-15
	KIAS							
Flaps 40º	50	60	70	80	90	100	110	120
	---	-10	-5	0	10	15	20	25

Figure 5-2, Altitude Correction

5.4 TEMPERATURE CONVERSION CHART

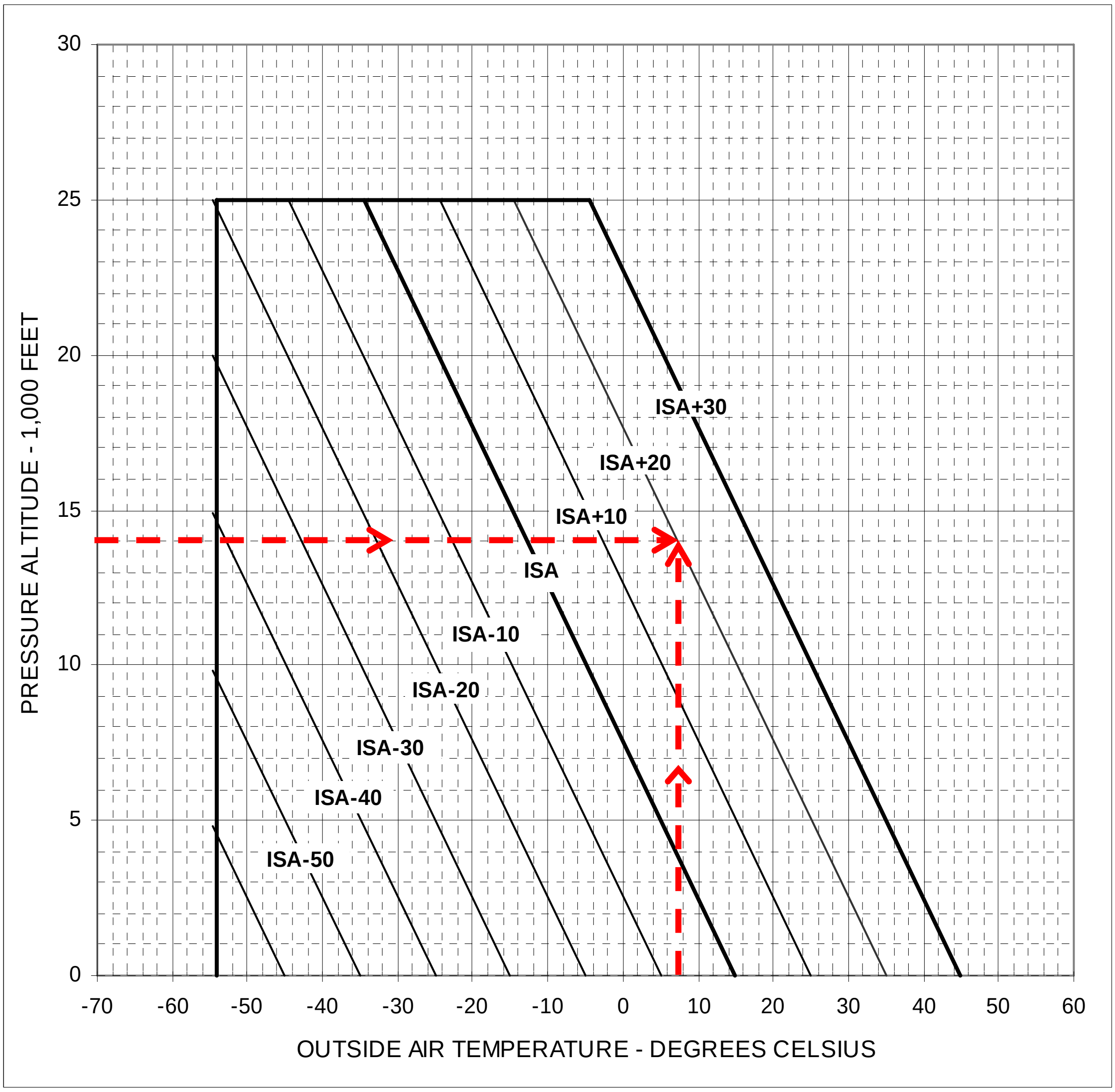
(FAHRENHEIT – CELSIUS)



Example: - 65ºF equals + 18ºC

Figure 5-3, Temperature Conversion Chart

ISA TEMPERATURE CONVERSION CHART



Example:

At a pressure altitude of 14,000 ft an outside air temperature of +7ºC equates to ISA +20ºC

Figure 5-4, ISA Temperature Conversion Chart

5.5 WIND COMPONENT CALCULATION CHART

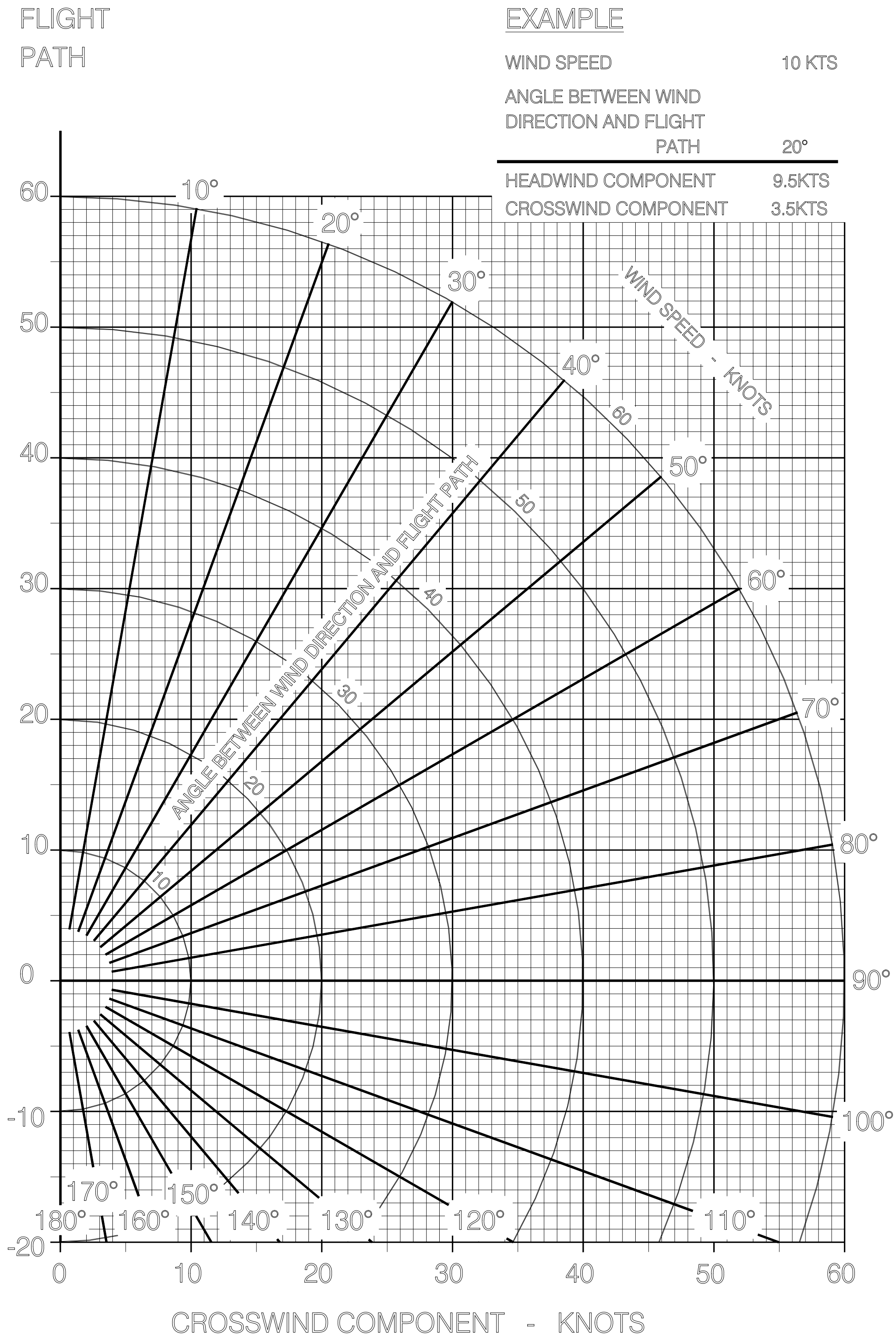


Figure 5-5, Wind Component Calculation Chart

5.6 STALL SPEEDS

CONDITIONS

Power Lever: Idle

Fuel Condition Lever: Flight Idle

Note

Altitude loss during stall recovery may be as much as 300 ft from a wings level stall, or even greater from a turning stall.

Stall speeds shown are at most forward center of gravity

WEIGHT lbs	FLAP SETTING	ANGLE OF BANK							
		0º		30º		45º		60º	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
7,500	UP	69	71	74	76	82	84	99	100
	20º	61	63	67	68	74	75	89	89
	40º	58	59	62	63	70	70	83	83
7,125	40º	57	58						
5,500	40º	51	53						
4,000	40º	45	47						

Figure 5–6, Stall Speeds

5.7 TAKEOFF PERFORMANCE

TAKE OFF PERFORMANCE

Forward Centre of Gravity Limit to 118.99” Aft of Datum

NORMAL TAKEOFF TECHNIQUE

Conditions:

Power	Takeoff power set before brake release
Flap	20°
Propeller	91.2% Np (2,006 RPM)
Inertial Separator	Normal
Runway	Paved, Level, Dry Surface

Temperature expressed as deviation from ISA.

Use temperature conversion charts if required.

Notes:

1. Normal Takeoff technique as specified in Section 4.
2. Decrease distances 7% for each 5 kts of headwind.
3. Up to 10 kts of tailwind increase distances by 12% for each 2.5 kts.
4. For operations off dry grass surfaces increase distances by 15% of the ground roll figure.
5. Sloping runways. Decrease distances by 4% per 1% down slope and increase distances by 6% per 1% of up slope.
6. With Inertial Separator in BYPASS increase distances by 3%.

TAKEOFF WEIGHT (lbs)	TAKE OFF SPEED KNOTS ~ IAS		PRESS ALT (ft)	ISA - 10°C		ISA		ISA +10°		ISA +20°C		ISA +30°C	
	Rotate Speed	Speed at 50ft		Ground Roll (ft)	Total to Clear 50ft (ft)	Ground Roll (ft)	Total to Clear 50ft (ft)	Ground Roll (ft)	Total to Clear 50ft (ft)	Ground Roll (ft)	Total to Clear 50ft (ft)	Ground Roll (ft)	Total to Clear 50ft (ft)
7500	61	76	S.L.	1173	1601	1244	1695	1316	1791	1439	1976	1603	2250
			2,000	1290	1756	1373	1866	1470	1996	1623	2247	1809	2566
			4,000	1427	1938	1522	2063	1667	2282	1841	2579	2049	2953
			6,000	1584	2144	1724	2345	1904	2638	2105	2996	2341	3457
			8,000	1870	2543	2058	2843	2274	3216	2519	3679	2808	4310
			10,000	2232	3086	2463	3476	2726	3960	3026	4593	3374	5488
6500	57	76	S.L.	939	1337	996	1414	1054	1492	1150	1640	1277	1851
			2,000	1032	1464	1099	1553	1176	1660	1296	1855	1439	2097
			4,000	1143	1612	1217	1713	1332	1888	1467	2114	1627	2392
			6,000	1267	1778	1376	1939	1516	2166	1668	2429	1854	2763
			8,000	1492	2100	1639	2332	1806	2612	1995	2948	2215	3377
			10,000	1777	2526	1955	2728	2159	3054	2389	3446	2656	3930
5500	52	76	S.L.	693	1025	734	1083	778	1143	847	1251	937	1402
			2,000	762	1121	811	1189	867	1269	954	1410	1054	1580
			4,000	842	1232	898	1308	981	1437	1078	1598	1190	1792
			6,000	933	1357	1013	1475	1144	1639	1226	1827	1353	2053
			8,000	1098	1596	1204	1763	1291	1929	1458	2195	1613	2476
			10,000	1304	1907	1433	2116	1577	2360	1739	2651	1925	3007
4500	48	67	S.L.	489	768	519	810	549	854	597	931	659	1039
			2,000	538	838	572	887	612	946	671	1046	740	1165
			4,000	595	920	634	975	691	1085	758	1180	835	1314
			6,000	658	1022	714	1097	783	1211	861	1342	948	1497
			8,000	772	1205	846	1303	930	1442	1021	1601	1127	1815
			10,000	916	1407	1005	1552	1105	1722	1216	1918	1343	2152

Figure 5-7, Takeoff Performance

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5.8 RATE OF CLIMB

RATE OF CLIMB PREDICTIONS.

The airplane's climb capability can be predicted for a known weight, altitude and temperature, at various altitudes by using the table in Figure 5-9.

Instructions

1. Select the table for the appropriate airplane weight.
2. Enter the table in the left hand column at the nominated altitude.
3. Move to the right, noting the best rate of climb airspeed.
4. Continue right into the column which represents the appropriate temperature and read the predicted rate of climb.

Example: 1

6,500 lb airplane at 12,000 ft in ISA conditions will climb at 1144 fpm.

Interpolation of intermediate readings

1. The easiest method is to simply round intermediate values up to the next higher weight, altitude or temperature, as appropriate, and accept the rate of climb displayed. This figure will be conservative and provide an increased safety margin for planning.
2. It is also acceptable to interpolate between the higher and lower values of the relevant variables. Variations in rate of climb are not linear with altitude; therefore, figures derived by this method will be approximate only.

Example: 2

Calculate rate of climb and best rate of climb speed for the following conditions:

Airplane Weight: 7,000 lbs
Altitude: 5,000 ft
OAT: 15ºC (ISA +10ºC from the ISA conversion chart in Figure 5-4)

1. From the 7,500 lb table the ISA + 10ºC rates of climb at 4,000 ft and 8,000 ft are 997 and 930 fpm respectively. As 5,000 ft lies ¼ of the way between 4,000 and 8,000 ft, subtract ¼ of the difference from the 4,000 ft value. (rate of climb decreases with increase in altitude)

e.g. Step 1. 997 – 930 = 67

Step 2. ¼ of 67 ≅ 17 therefore the rate of climb at 5,000 ft, at 7,500 lbs, is 997 -17 ≅ 980 fpm.

2. Repeat the same steps on the 6,500 lb table.

    e.g. Step 1. 1321 – 1255 = 66

    Step 2. ¼ of 67 ≅ 17 therefore the rate of climb at 5,000 ft, at 6,500 lbs, is 1321 -17 ≅ 1304 fpm.

3. The example airplane weights 7,000 lbs (half way between 6,500 lbs and 7,500 lbs), therefore rate of climb will be half way between 980 and 1304 fpm;

    (980 + 1304)/ 2 = 1142 fpm (approximate rate of climb)

4. The best rate of climb speed is extrapolated using the climb speed from the 7500 lb table of 91 KIAS and the climb speed from the 6500 lb table of 88 KIAS. The example airplane weighs 7000 lbs (halfway between 6500 lbs and 7500lbs); therefore, the best climb speed is halfway between the speed for 7500 lbs and 6500 lbs.

    89 ½ (or ≅ 90 KIAS)

RATE OF CLIMB TABLES

CONDITIONS

Flaps: Up
Power: Maximum continuous power (54 psi) or lesser power as limited by altitude and within the engine limits of Ng 101.6% and ITT 740ºC.
Propeller Lever: Max rpm

Inertial Particle Separator (IPS): Normal

7,500 lbs		Rate of Climb (feet per minute)				
Altitude (ft)	KIAS	ISA -10°C	ISA	ISA +10°C	ISA +20°C	ISA +30°C
0	91	1,081	1,067	1,052	1,039	1,026
4,000	91	1,033	1,015	997	981	908
8,000	91	974	951	930	828	689
12,000	91	887	823	727	615	495
16,000	91	617	515	407	279	148
20,000	91	429	338	246	132	5

6,500 lbs						
Altitude (ft)	KIAS	ISA -10°C	ISA	ISA +10°C	ISA +20°C	ISA +30°C
0	88	1,399	1,384	1,371	1,359	1,347
4,000	88	1,355	1,337	1,321	1,305	1,223
8,000	88	1,298	1,277	1,255	1,144	987
12,000	88	1,212	1,144	1,038	915	787
16,000	88	992	901	795	670	539
20,000	88	719	624	525	401	264

5,500 lbs						
Altitude (ft)	KIAS	ISA -10°C	ISA	ISA +10°C	ISA +20°C	ISA +30°C
0	85	1,811	1,795	1,783	1,772	1,760
4,000	85	1,767	1,752	1,734	1,720	1,630
8,000	85	1,714	1,694	1,675	1,547	1,368
12,000	85	1,630	1,550	1,432	1,296	1,152
16,000	85	1,388	1,286	1,168	1,028	883
20,000	85	1,089	988	874	733	583

4,500 lbs						
Altitude (ft)	KIAS	ISA -10°C	ISA	ISA +10°C	ISA +20°C	ISA +30°C
0	81	2,369	2,355	2,341	2,329	2,316
4,000	81	2,324	2,307	2,294	2,279	2,173
8,000	81	2,273	2,257	2,240	2,089	1,884
12,000	81	2,197	2,103	1,966	1,806	1,643
16,000	81	1,922	1,803	1,669	1,508	1,345
20,000	81	1,585	1,474	1,344	1,180	1,009

Figure 5-9, Rate of Climb

5.9 TIME, FUEL AND DISTANCE TO CLIMB

Time, fuel and distance figures may be calculated from the table shown in Figure 5-10. The time, fuel and distance figures are based on a climb from sea level.

Instructions

For a climb from sea level:

1. Enter the table from the left at the planned top of climb altitude.
2. Select the line which represents the airplane takeoff weight.
3. Move to the right into the columns which represent the forecast operating temperature expressed as deviation from ISA conditions.
4. Read off the time, distance and fuel from the respective columns.

For a climb initiated above sea level proceed as follows:

1. First establish the time, distance and fuel required to reach planned altitude assuming the climb was initiated from sea level as above.
2. Now determine the time, distance and fuel figures for a climb from sea level to the starting altitude for the actual planned climb.
3. These values of time, distance and fuel are now deducted from the initial figures established in Step 1.

Example

Calculate time, distance and fuel used for a climb in the following conditions:

Airplane Weight At Takeoff: 6,500 lbs

Forecast Temperature Range: ISA +10ºC

Climb Commenced From: 4,000 ft to 16,000 ft

1. Enter the table at the 16,000 ft band. From the line of figures for a 6,500lb takeoff weight read time distance and fuel in the ISA +10ºC columns.

   Time = 14 minutes Distance = 24 nm Fuel = 50 litres (88 lbs)

2. Now enter the table in the 4,000 ft band at 6,500 lbs. The ISA +10ºC values are:
3. Time = 3 minutes Distance = 5 nm Fuel = 12 litres (22 lbs)

4. Subtracting the 4,000 ft values from the 16,000 ft values gives the required time distance and fuel to climb from 4,000 ft to 16,000 ft.

Time = 11 minutes Distance = 19 nm Fuel = 38 litres (66 lbs)

NOTE

The variation in climb performance is not linear with increasing altitude. Interpolating directly between altitude bands is likely to produce erroneous figures. The planning purposes the preferred method is to round up to the next higher level. This will provide a conservative figure for planning with an increased safety margin.

TIME, FUEL AND DISTANCE TO CLIMB TABLES

CONDITIONS

Flaps:	Up
Power:	Maximum continuous power (54 psi torque) or lesser power as limited by altitude and within the maximum climb limits of Ng 101.6% and ITT 740ºC.
Propeller Lever:	Max rpm
Airspeed:	For maximum rate of climb

Notes

1. *Add 22 litres (39 lbs of fuel) for start, taxi and takeoff allowance.*
2. *Distances shown are based on zero wind conditions.*
3. *With inertial separator in BYPASS increase time fuel and distances figures by 1% per 1,000 ft of climb.*

			Temperature								
			ISA – 10ºC			ISA			ISA + 10ºC		
Pressure	Climb	Takeoff	From Sea Level								
Altitude ft	Speed KIAS	Weight lbs	Time min	Dist nm	Fuel litres (lbs)	Time min	Dist nm	Fuel litres (lbs)	Time min	Dist nm	Fuel litres (lbs)
Sea Level	91	7,500	-	-	-	-	-	-	-	-	-
	88	6,500	-	-	-	-	-	-	-	-	-
	85	5,500	-	-	-	-	-	-	-	-	-
	81	4,500	-	-	-	-	-	-	-	-	-
4,000	91	7,500	4	6	15 (27)	4	6	15 (27)	4	6	16 (29)
	88	6,500	3	4	12 (22)	3	5	12 (22)	3	5	12 (22)
	85	5,500	2	3	9 (16)	2	3	9 (16)	2	3	10 (18)
	81	4,500	2	2	7 (13)	2	2	7 (13)	2	3	7 (13)
8,000	91	7,500	8	13	30 (53)	8	13	31 (55)	8	14	31 (55)
	88	6,500	6	9	23 (41)	6	10	23 (41)	6	10	24 (43)
	85	5,500	5	7	18 (32)	5	7	18 (32)	5	7	18 (32)
	81	4,500	3	5	14 (25)	3	5	14 (25)	3	5	14 (25)
12,000	91	7,500	12	20	46 (81)	12	21	47 (83)	13	22	49 (87)
	88	6,500	9	15	35 (62)	9	15	35 (62)	10	16	36 (64)
	85	5,500	7	11	27 (48)	7	11	27 (48)	7	12	27 (48)
	81	4,500	5	8	20 (36)	5	8	20 (36)	5	8	20 (36)
16,000	91	7,500	17	30	64 (113)	18	33	67 (118)	20	36	71 (125)
	88	6,500	13	21	47 (83)	13	23	49 (87)	14	24	50 (88)
	85	5,500	10	16	35 (62)	10	16	36 (64)	10	17	37 (66)
	81	4,500	7	11	27 (48)	7	12	27 (48)	8	12	28 (50)
20,000	91	7,500	25	46	88 (155)	28	52	95 (168)	32	62	106 (187)
	88	6,500	17	30	62 (110)	18	33	64 (113)	20	37	68 (120)
	85	5,500	13	22	46 (81)	13	23	47 (83)	14	25	48 (85)
	81	4,500	9	15	34 (60)	10	16	35 (62)	10	17	35 (62)

Figure 5-10, Time, Fuel and Distance To Climb

5.10 CRUISE

The cruise tables in Figure 5-11 provide information to assist in the selection of cruising altitudes and power settings. Tables provide information at 5 different pressure altitudes: - 500 ft, 5000 ft, 10,000 ft, 15,000 ft and 20,000 ft. Cruise details also cover 3 different propeller rpm settings: - 91.2% Np (2006 rpm), 85% Np (1870 rpm) and 80% Np (1760 rpm).

Select the table which is closest to the intended cruising altitude. Three propeller rpm bands are represented on each table (except the 20,000 ft table which assumes maximum rpm only). Representative torque settings (psi) are displayed in each band and by moving to the right into the appropriate temperature column (expressed as deviation from ISA) the values of true airspeed (KTAS) and fuel flow LPH and pph are displayed.

The tables show some torque values which exceed maximum continuous power settings. These torque readings are identified with an asterix (*) and associated true airspeed and fuel flow figures are displayed on a shaded background. These values have been included to provide a more complete trend picture of power available and fuel flow versus airspeed at lower altitudes. These power settings are not to be used in cruise flight.

The cruise performance figures are for a 7,500 lb airplane. For planning purposes these figures should be used for all weights. At lighter weights the figures will be conservative.

CRUISE TABLES

Cruise Performance

Pressure Altitude: 500 feet

Prop rpm	Torque (psi)	(ISA -20ºC) KTAS	(ISA -20ºC) LPH (pph)	Standard Temperature (ISA) KTAS	Standard Temperature (ISA) LPH (pph)	(ISA +20ºC) KTAS	(ISA +20ºC) LPH (pph)
91.2% Np 2006 rpm	64*	162	268 (472)	168	269 (474)	-	-
	52	155	252 (444)	161	252 (444)	168	255 (450)
	50	146	218 (384)	151	222 (391)	156	225 (396)
	45	139	203 (358)	144	207 (365)	149	211 (372)
	40	130	183 (323)	135	187 (330)	140	191 (337)
	35	122	171 (301)	127	175 (308)	131	178 (314)
85% Np 1870 rpm	64*	159	257 (453)	165	260 (458)	-	-
	52	155	246 (434)	161	251 (443)	168	256 (451)
	50	143	208 (367)	148	212 (374)	153	216 (381)
	45	136	193 (340)	141	196 (345)	146	200 (352)
	40	130	181 (319)	135	185 (326)	140	189 (333)
	35	119	163 (287)	124	166 (293)	128	170 (300)
80% Np 1760 rpm	64*	156	249 (439)	162	253 (446)	168	258 (455)
	50	141	204 (360)	146	208 (367)	151	212 (374)
	45	133	185 (326)	138	189 (333)	143	194 (342)
	40	126	171 (301)	131	175 (308)	135	179 (316)
	35	118	158 (279)	122	162 (286)	127	166 (293)

Pressure Altitude: 5,000 ft

Prop rpm	Torque (psi)	(ISA -20ºC) KTAS	(ISA -20ºC) LPH (pph)	Standard Temperature (ISA) KTAS	Standard Temperature (ISA) LPH (pph)	(ISA +20ºC) KTAS	(ISA +20ºC) LPH (pph)
91.2% Np 2006 rpm	61*	166	252 (444)	-	-	-	-
	53	156	225 (397)	162	228 (402)	168	231 (408)
	50	152	212 (374)	158	215 (379)	164	219 (386)
	45	146	195 (344)	152	198 (349)	157	202 (356)
	40	138	178 (314)	143	181 (319)	148	185 (326)
	35	129	161 (284)	133	164 (289)	138	168 (296)
85% Np 1870 rpm	63*	157	252 (444)	163	255 (449)	169	246 (433)
	50	145	200 (352)	151	204 (360)	156	207 (365)
	45	139	187 (330)	144	190 (335)	149	194 (342)
	40	132	170 (300)	137	174 (307)	141	177 (312)
	35	122	155 (273)	127	158 (279)	131	162 (286)
80% 1760 rpm	64*	160	245 (432)	166	249 (439)	-	-
	53	156	236 (416)	162	240 (423)	168	244 (430)
	50	144	190 (335)	150	194 (342	155	198 (349)
	45	136	178 (314)	141	182 (321)	146	186 (328)
	40	131	166 (293)	136	170 (300)	140	174 (307)
	35	117	148 (261)	122	152 (268)	126	156 (275)

Figure 5-11, Cruise Table (Sheet 1 of 2)

Pressure Altitude: 10,000 ft

Prop rpm	Torque (psi)	(ISA -20º)		Standard Temperature (ISA)		(ISA +20º)	
		KTAS	LPH (pph)	KTAS	LPH (pph)	KTAS	LPH (pph)
91.2% Np 2006 rpm	52	161	215 (379)	167	218 (384)	-	-
	49	156	204 (359)	163	206 (364)	169	209 (369)
	45	150	189 (333)	156	192 (338)	161	195 (344)
	40	142	170 (300)	147	173 (305)	153	176 (310)
	35	133	155 (273)	138	158 (279)	143	161 (284)
85% Np 1870 rpm	54	162	215 (379)	168	219 (386)	-	-
	49	156	200 (352)	163	203 (358)	169	206 (364)
	45	150	182 (321)	156	185 (326)	161	189 (333)
	40	141	164 (289)	146	167 (294)	152	170 (300)
	35	131	148 (261)	136	151 (266)	141	154 (272)
80% Np 1760 rpm	56*	157	215 (379)	164	219 (386)	170	214 (377)
	45	143	169 (298)	149	172 (303)	154	175 (308)
	40	133	157 (277)	138	161 (284)	143	164 (289)
	35	122	140 (247)	127	144 (254)	131	147 (259)

Pressure Altitude: 15,000 ft

Prop rpm	Torque (psi)	(ISA -20º)		Standard Temperature (ISA)		(ISA +20º)	
		KTAS	LPH (pph)	KTAS	LPH (pph)	KTAS	LPH (pph)
91.2% Np 2006 rpm	45	157	193 (340)	163	195 (344)	169	185 (326)
	40	147	167 (294)	153	169 (298)	159	172 (303)
	35	135	145 (256)	141	148 (261)	146	150 (264)
85% Np 1870 rpm	46	152	183 (323)	158	186 (328)	164	179 (316)
	40	141	159 (280)	147	162 (286)	153	165 (291)
	35	128	141 (249)	133	144 (254)	138	147 (259)
80% Np 1760 rpm	47	152	183 (323)	158	186 (328)	164	181 (319)
	40	136	154 (272)	142	157 (277)	147	161 (284)
	35	119	134 (236)	124	137 (242)	129	140 (247)

Pressure Altitude: 20,000 ft

Prop rpm	Torque (psi)	(ISA -20º)		Standard Temperature (ISA)		(ISA +20º)	
		KTAS	LPH (pph)	KTAS	LPH pph	KTAS	LPH (pph)
91.2% Np 2006 rpm	38	149	165 (291)	155	169 (298)	162	154 (272)
	35	140	147 (259)	146	149 (263)	152	145 (256)

Figure 5-11, Cruise Tables (Sheet 2 of 2)

5.11 TIME, FUEL AND DISTANCE TO DESCEND

CONDITIONS

Flaps: Up
Descent Rate: 800 fpm
Power: As required to maintain 140 KIAS
Propeller Lever: Max rpm

Notes

1. *At very high altitude the available power may not be sufficient to achieve 140 KIAS with a constant descent rate of 800 fpm. In this case the table assumes the constant descent rate was maintained rather than the airspeed.*

2. *Distances shown are based on zero wind conditions.*

3. *Table figures assume a descent to sea level.*

4. *Variations in airplane weight and temperature will have a minimal effect on the table figures. Figures are therefore assumed valid for all weights and temperatures.*

Instructions

Descent to sea level:

1. Read time, distance and fuel figures from the line that represents the desired cruising level.

Descent to intermediate level:

1. Carry out Step 1 above.

2. Deduct the corresponding figures which are displayed at the level off altitude.

Interpolation.

Variations between altitudes are approximately linear therefore it is acceptable to interpolate between tabled figures. As the incremental change between levels is small the preferred method is to round up to the next higher level and use table figures for planning.

Pressure Altitude (ft)	Time (min)	Distance (nm)	Fuel litres (lbs)
20,000	25	71	64 (113)
16,000	20	55	51 (90)
12,000	15	40	39 (69)
8,000	10	26	26 (46)
4,000	5	13	13 (23)
Sea Level	0	0	0 (0)

Figure 5–12, Time, Fuel and Distance To Descend

5.12 RANGE PROFILE

CONDITIONS

Takeoff Weight: 7500 lbs
Takeoff Fuel: 829 litres (1459 lbs)
Graph is based on a mid mission weight.

NOTES

1. Range includes start, taxi, takeoff, climb and descent with 45 minutes reserve fuel at maximum range power.
2. Distances are based on zero wind conditions.
3. The indicated airspeeds for best range, at 7500 lbs, are;
   125 KIAS at sea level
   115 KIAS at 10,000 feet
   110 KIAS at 15000 feet
4. Set desired Np, adjust power lever to maintain indicated airspeed for best range.
5. Reduced rpm settings apply to cruise phase of flight only.

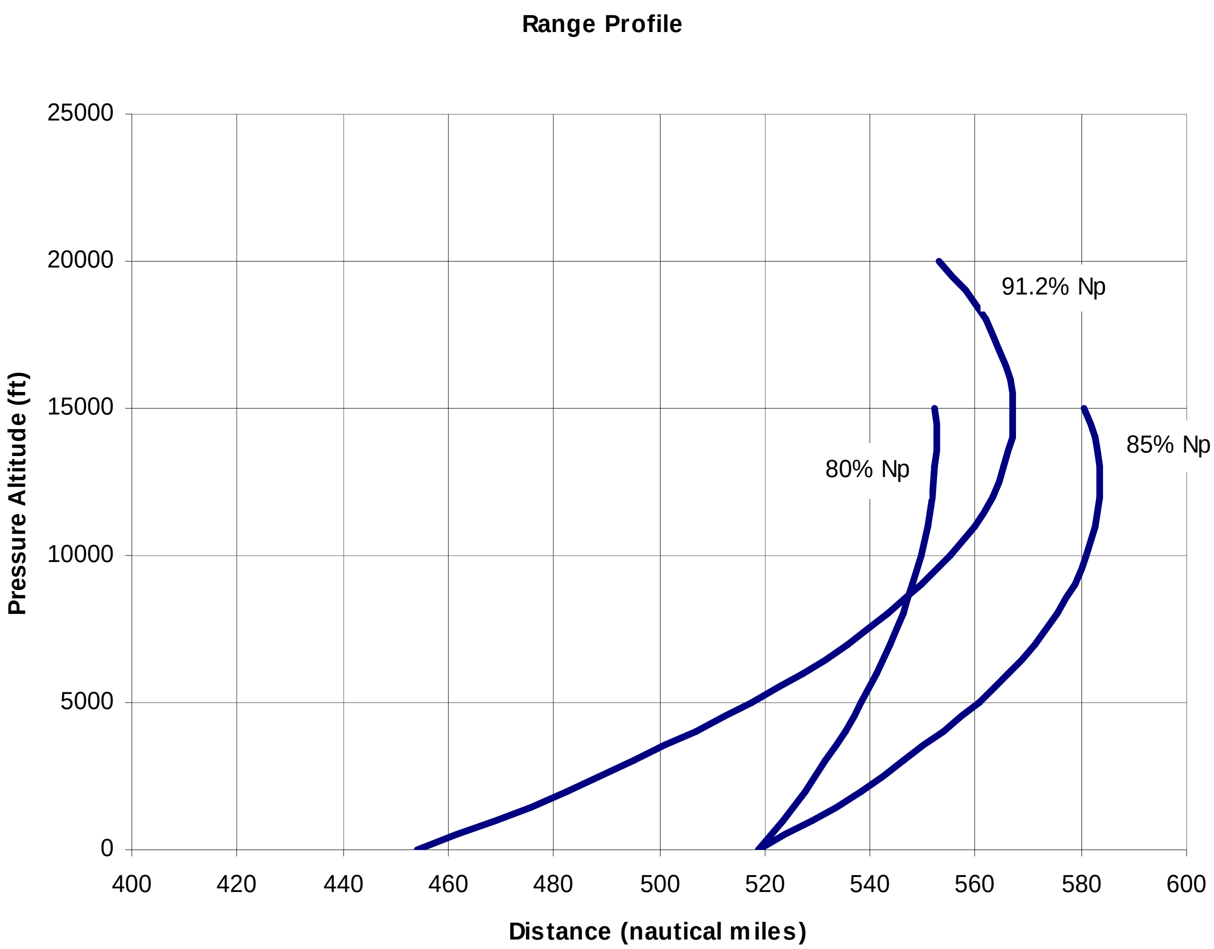

Figure 5-13, Range Profile

5.13 ENDURANCE PROFILE

CONDITIONS

Takeoff Weight: 7500 lbs
Takeoff Fuel: 829 litres (1459 lbs)

NOTES

1. Endurance time includes takeoff from sea level, maximum rate climb (as in Section 5.9) and descent (as in Section 5.11) with 45 minutes reserve fuel (at maximum range power) remaining after landing.
2. Best endurance speed is 90 KIAS below 15,000 ft.
3. Set desired Np, adjust power lever to maintain indicated airspeed for best endurance.
4. Reduced rpm settings apply to cruise phase of flight only.

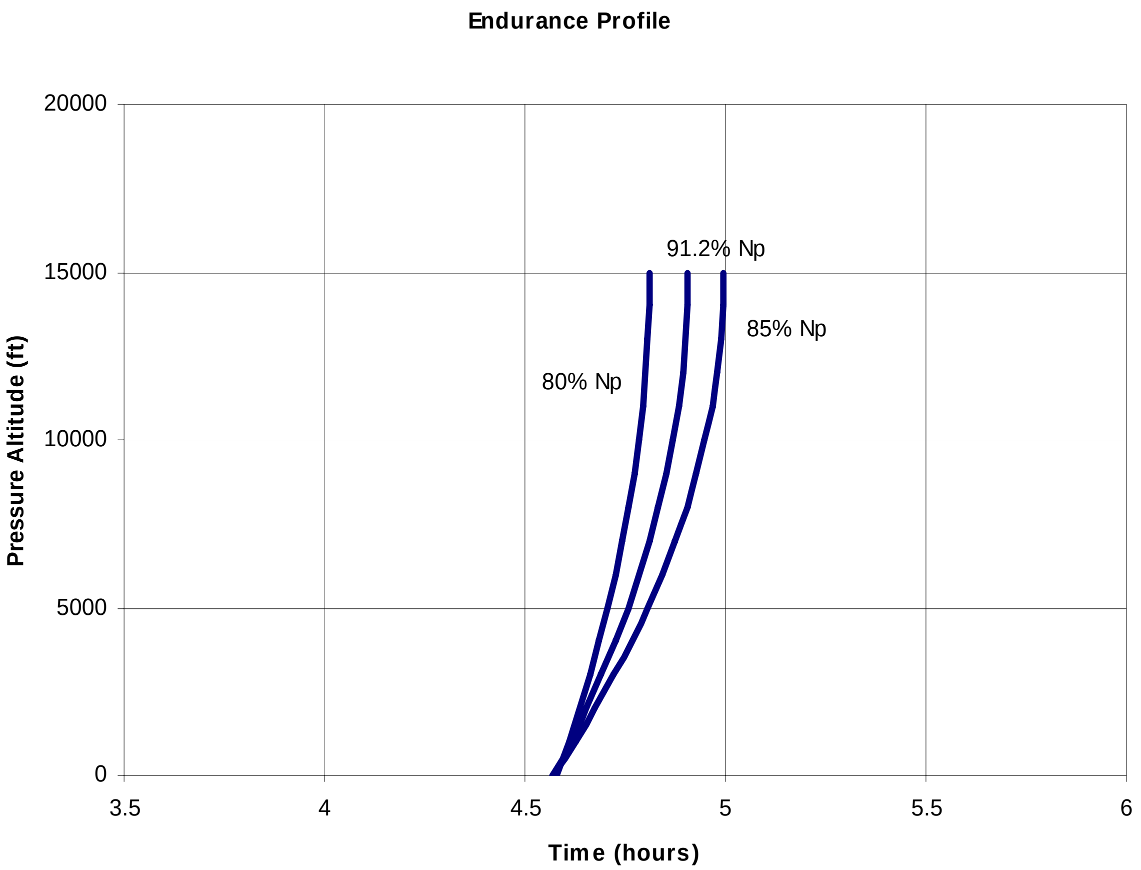

Figure 5-14, Endurance Profile

5.14 LANDING DISTANCE

NORMAL LANDING TECHNIQUE

CONDITIONS:

Power:	To maintain a 3º approach angle to touchdown.
Flap:	40º
Propeller Lever:	Maximum rpm
Airspeed:	1.3 Vso to 50 ft then reducing.
Braking:	Maximum wheel braking.
Surface:	Paved, level, dry runway.

NOTES

1. *Normal Landing technique as specified in Section 4.*
2. *Decrease distance by 7% for each 5 knots of headwind.*
3. *Up to 10 knots of tailwind increase distances by 12% for each 2.5 knots of tailwind.*
4. *For operations on dry grass, increase ground roll distance by 15%.*
5. *If required to land flaps up, add 8 to 13 knots to the approach speed (8 knots at 4,000 lbs weight up to 13 knots at maximum landing weight of 7,125 lbs) and increase the required landing distance by 25%.*
6. *Use of beta and reverse thrust may reduce ground roll distance on a dry runway by 5%.*

(7,125 lbs and all lesser weights)

Pressure Altitude (ft)	ISA Deviation (°C)	Ground Roll (ft)	Total distance over a 50' obstacle (ft)
0	-10	791	1,928
	0	866	2,075
	10	851	2,046
	20	881	2,105
	30	911	2,164
2,000	-10	851	2,045
	0	883	2,108
	10	915	2,172
	20	948	2,236
	30	980	2,301
4,000	-10	916	2,173
	0	951	2,242
	10	985	2,312
	20	1,020	2,382
	30	1,055	2,452
6,000	-10	987	2,315
	0	1,024	2,390
	10	1,062	2,466
	20	1,099	2,542
	30	1,137	2,618

Figure 5-15, Landing Distance, Sheet 1 of 2

Pressure Altitude (ft)	ISA Deviation (^{o}C)	Ground Roll (ft)	Total distance over a 50' obstacle (ft)
8,000	-10	1,065	2,570
	0	1,105	2,656
	10	1,146	2,741
	20	1,186	2,828
	30	1,227	2,914
10,000	-10	1,150	2,856
	0	1,194	2,953
	10	1,237	3,050
	20	1,281	3,148
	30	1,325	3,245

Figure 5-15, Landing Distance, Sheet 2 of 2

SECTION 6

WEIGHT AND BALANCE AND EQUIPMENT LIST

TABLE OF CONTENTS

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6.1 GENERAL

INTRODUCTION

This section contains the weight and balance information required by the Civil Aviation Authority of New Zealand and United States of America Federal Aviation Administration. In order to achieve the performance and flight characteristics detailed in the handbook it is essential that the airplane be operated within the approved weight and centre of gravity limits.

Weight is important as it is the basis for many structural limits and critical flight characteristics. Weight in excess of the maximum takeoff weight (7500 lbs) may be a contributing factor in an accident, especially when combined with conditions of high altitude and temperature which may seriously reduce performance margins.

Safe operations require careful planning and a sound knowledge of airplane performance capabilities as affected by weight, altitude and temperature. In conditions of high altitude and/or temperature it may be necessary to limit the operating weight to below maximum limits to ensure adequate performance.

WARNING

It is the responsibility of the pilot to ensure that the airplane is loaded properly and operated within the prescribed limits. Operating outside of prescribed limits may result in an accident and serious or fatal injury.

A properly loaded and maintained airplane will perform as intended, and in accordance with the relevant performance predictions in this handbook.

6.2 AIRPLANE WEIGHING PROCEDURES

WEIGHING

The following paragraphs detail the procedure used to determine the empty airplane weight and balance figures. To calculate an accurate empty airplane weight it is essential that the procedures are followed.

Weighing the airplane should be accomplished on level ground in a hangar devoid of wind disturbance. The scales used must be properly calibrated and of sufficient capacity to support the airplane. The following checklist is used to ensure the airplane is correctly prepared for weighing.

Empty the cabin and cockpit of equipment which is not part of the basic airplane equipment eg, pilot related equipment such as flight bags and headsets.

Clean the airplane internally and externally.

Ensure the airplane is fitted only with that equipment listed on the airplane's weight and balance report (Figure 6-3) and equipment list shown as Figure 6-5, all other equipment and loose articles must be removed.

Drain all the fuel leaving only the unusable fuel in the tanks.

Ensure the engine oil level is filled to the full mark.

Check that the tires are correctly inflated and that the shock struts are correctly charged.

Fit the control column lock.

Flaps up.

Doors closed.

Place scales under each wheel and chock the main wheels ensuring that the brakes are OFF. Allow the airplane weight to settle evenly on the scales.

Next the airplane must be leveled. The airplane leveling points are shown in Figure 6-1.

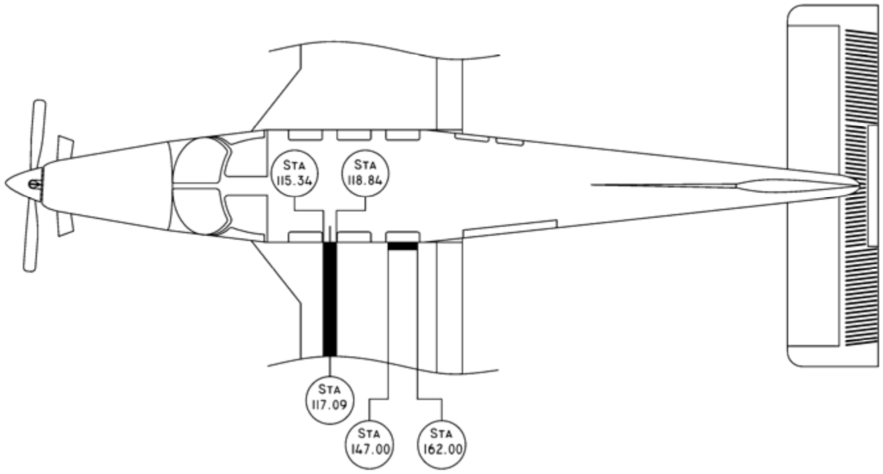

Figure 6-1, Airplane Leveling Points

Lateral Leveling Point:	Across the main wing spar.
Longitudinal Leveling Point:	Rivnuts (2) at STA 147 and 162, right hand side. Remove 10-32 UNF blanking screws and insert bolts of a suitable length to support a leveling board.

Place spirit levels at the lateral and longitudinal leveling points.

Level the airplane laterally by deflating the main wheel tires as required.

Level the airplane longitudinally (deflate nose wheel tire and/or shock strut as required). Recheck lateral and longitudinal level. The airplane is level when the bubbles are centred in both spirit levels.

Record the weight shown on each scale in the appropriate space in the weight and balance report (CAA 2102) shown as Figure 6-3.

Record the weight of the chocks in the appropriate space in the weight and balance report (CAA 2102) shown as Figure 6-3.

Measure the distance of the datum from the centre line of the main wheels, distance M. Record in the appropriate space on the weight and balance report (CAA 2102) shown as Figure 6-3.

Measure the distance between the centre of the nose wheel axle and the centre of the main wheel axle, distance L. Record in the appropriate space on the weight and balance report (CAA 2102) shown as Figure 6-3.

On completion of the weighing operation, ensure that the tires are inflated to the correct pressures and that the landing gear shock struts are correctly charged (refer to the airplane maintenance manual) before moving the airplane.

DATUM

The datum is defined as fuselage STA “0.00”.

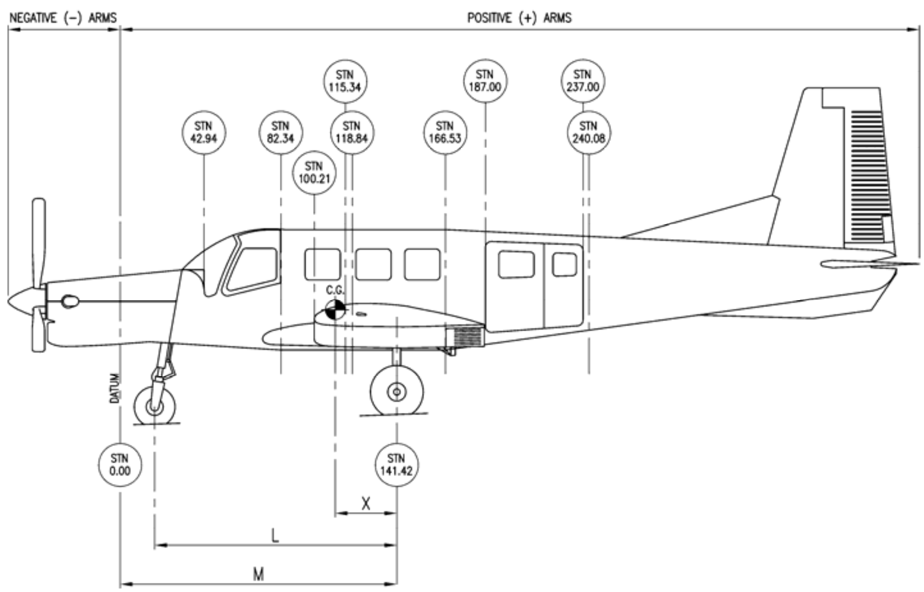

Figure 6-2, Airplane Arms and Stations

EMPTY AIRPLANE WEIGHT AND MOMENT CALCULATION

The following paragraphs describe the calculations used to calculate an empty airplane weight and moment.

Complete the front page of the weight and balance report form (CAA 2102) shown as Figure 6-3.

Record the data on the reverse side of the weight and balance report form (CAA 2102) shown as Figure 6-3.

Measurements

L = distance between the points of reaction, with the airplane in the weighing position. Refer to Figure 6-2 for an illustration of L.

M = distance of datum from the centre line of the main wheels. Refer to Figure 6-2 for an illustration of M.

W = total weight of both main wheels as read of the scales under each main wheel.

w = weight of the nose wheel as read off the scales under the nose wheel.

Calculations

Record the airplane weighing scale readings and chock weights on the weight and balance report (CAA 2102) shown as Figure 6-3.

WHEEL OR JACK POINT	SCALE READING (lbs.)	TARE WEIGHT (lbs.)	NET WEIGHT (lbs.)	
Left Main	1185	3 (chocks)	1182	
Right Main	1191.75	3 (chocks)	1188.75	
Total Both Mains	2376.75	6	2370.75	= W
Nose	757.75	-	757.75	= w
TOTAL AS WEIGHED	3134.50	6	3128.50	= W + w

Table 1, Example Weight Figures

Determine the net weights and enter on the weight and balance report (CAA 2102) shown as Figure 6-3.

Calculate the distance of the net weight centre of gravity arm forward of the main wheels using the following formula:

$$X = \frac{L \times w}{W + w}$$

Example:

Using entries from Table 1 above and a value for L of 125.44 inches

$$X = \frac{125.44 \times 757.75}{2370.75 + 757.75}$$

$$X = \frac{95052.16}{3128.50}$$

$$X = 30.38 \text{ ins.}$$

Calculate the distance of the net weight centre of gravity aft of the datum, distance M, using the following formula:

M – X = Arm

Example:

140.96 – 30.38

M = 110.58 ins.

Enter arm in the weight and balance report (CAA 2102) shown in Figure 6-3.

Item	Description	Net Weight (lbs.)	Arm m. (in)	Moment (lb.in.)
1	Net Weight (W +w)	3128.50	110.58	345,949.5
2	Total items weighed but not part of empty weight			
3	Total items being part of empty weight not weighed			
4	Aircraft Empty Weight	3128.50	110.58	345949.5

Calculate the moment as follows and enter in the weight and balance report (CAA 2102) shown in Figure 6-3:

Net Weight x Arm = Moment

Example:

3128.50 x 110.58 = 345,949.53 lb.in

Repeat the above calculations for items weighed but not part of empty weight and items part of empty weight not weighed and enter in the weight and balance report (CAA 2102) shown in Figure 6-3.

Total the columns remembering to subtract the figures for items weighed but not part of empty weight and add the amounts for items part of empty weight not weighed and enter in the weight and balance report (CAA 2102) shown in Figure 6-3.

The completed weight and balance report (CAA 2102) shown in Figure 6-3 is to be inserted in the airplane logbook.

Ensure the appropriate airplane weight and balance record forms as shown in Figures 6-4 and 6-5 are completed and entered into the airplane flight manual.

CENTRE OF GRAVITY LIMITS

The forward limits are:

100.46 inches aft of datum at 4209 lbs or less
103.18 inches aft of datum at 5639 lbs
111.55 inches aft of datum at 7500 lbs
With linear variation between these points.

The aft limit is 125.60 inches aft of datum at all weights.

AIRCRAFT WEIGHT AND BALANCE REPORT

CAA CIVIL AVIATION AUTHORITY OF NEW ZEALAND

Aircraft Registration ZK-.................. Aircraft Type:
.... Report Ref. No: ....

1. The above aircraft was weighed at:...on ..../ ..../19 .... by ....

Using weighing equipment Serial No's	1.	2.	3.
Date each scale last calibrated			

2. Reason for weighing..
3. Datum Reference..
3. Weighing position...
4. The aircraft was weighed in conformity with:

Manufacturer's instructions: ☐

Other:... ☐

Weighing equipment make and model:

1. ....
2. ....
3. ....

EQUIPMENT LIST

The following items of equipment are included in the Empty Weight figure given in the Weight and Balance supplement of the Flight Manual.

Removable Equipment with Fixed Location Installed at Weighing	Quantity	Removable Equipment with Fixed Location Installed at Weighing	Quantity

CAA 2102
Rev 2. 01/97

Figure 6-3, Weight and Balance Report (CAA 2102)

Wheel or Jack Point	Scale Reading kg. (lb.)	Tare Weight kg. (lb.)	Net Weight kg. (lb.)	
Left Main				
Right Main				
*Total both Mains				= W
*Nose or Tail				=w
Total as weighed				= W + w

*NOTE: For Helicopter W = Total - both forward Jack Points
w = Total aft Jack Points

Item	Description	Net Weight kg (lb.)	Arm m. (in)	Moment kg.m (lb.in)
1.	Net Weight (W + w)			
2.	Total items weighed but not part of empty weight			
3.	Total items being part of empty weight not weighed			
4.	Aircraft Empty Weight			

The information required for entry in the loading data is:

Empty Weight = ...kg (lb.)

Distance of Empty Weight C.G

Aft/Fwd of Datum = ...m. (in)

Moment = ...kg.m (lb.in)

The Weight and Balance inspection recorded above has been carried out in accordance with the New Zealand Civil Aviation Rules currently in force and in respect of that work the aircraft is fit for release to service.

Signed: .... Licence or Approval No: ....

Date: ..../ ..../19 ....

NOTE: When completed, insert this form in the aircraft logbook.
Insert new pages in the aircraft or helicopter Flight Manual Weight and Balance Supplement as required by Advisory Circular AC 43.2.

AEROPLANES and GLIDERS

L = ...m. (in) M = ... m. (in)

X = $\frac{L \times w}{W + w}$ = $\frac{x}{+}$ = ... m. (in)

Nose Wheel or Jack Point: M - X = ... m. (in)

Tail Wheel or Jack Point: M + X = ... m. (in)

Where

L = measured distance between weighing points with aircraft in weighing position
M = Distance of datum from centre line of main wheels
X = Arm of the C of G for the 'as weighed' condition.

HELICOPTERS (Longitudinal C of G calculation)

L = ...m. (in) M = ... m. (in)

Forward Datum X = $\frac{(W \times M)+(w \times L)}{W + w}$ = ... m. (in)

Central Datum X = $\frac{-(W \times M)+(w \times L)}{W + w}$ = ... m. (in)

Where

L = Distance of Datum forward of aft jacking point
*M = (Forward datum) = Distance of datum fwd of fwd jack point

*M = (Central datum) = Distance of datum aft of fwd jack point
X = Arm of the C of G.

*NOTE: To be obtained from Manufacturers data

HELICOPTERS (Lateral C of G Calculation)

X = $\frac{-(AL \times C) + (BR \times D)}{(C + D)}$ = ... m. (in)

Where

AL = Measurement of C/L to left Jacks
BR = Measurement of C/L to right Jacks
C = Weight on left Jacks
D = Weight on right Jacks
C/L to left is negative
C/L to right is positive
X = Arm of C of G from C/L
C/L = Longitudinal centre line

Figure 6-3, Weight and Balance Report (CAA 2102)

6.3 WEIGHT AND BALANCE RECORD

Figure 6-4 shows a sample weight and balance record form which is retained in the airplane handbook. This form is used to provide a continuous history of changes in structure and or equipment affecting weight and balance. This record should be updated to reflect changes to the basic airplane configuration and the effects of those configuration changes on the basic empty weight and centre of gravity. The information provided on this form allows for the correction of basic empty weight and centre of gravity with changes to the airplane's basic configuration as required for a particular task, eg removal of passenger seats for cargo operations.

AIRPLANE MODEL				**SERIAL NUMBER**				**PAGE NUMBER**			
DATE	ITEM No		DESCRIPTION OF ARTICLE OR MODIFICATION	**WEIGHT CHANGE**						**RUNNING BASIC EMPTY WEIGHT**	
				ADDED (+)			**REMOVED (-)**				
	In	Out		Wt. (lb)	Arm (in.)	Moment /1000	Wt. (lb)	Arm (in.)	Moment /1000	Wt. (lb)	Moment /1000

Figure 6-4, Weight and Balance Record

Weight and Balance Data

A new sheet is to be completed whenever revised weight and balance data is established either by weighing or calculation.

Aircraft Make and Model	
EMPTY WEIGHT (See Note 1)	
Datum Reference	STA 0.00
C of G POSITION (state Fwd or Aft of Datum)	
MOMENT	

Data established by calculation

Performed by:

On (date)	
Reason	
Report Ref (if applicable)	

If established by calculation, state when aircraft last weighed.

Notes:

1. Empty weight includes unusable fuel, fixed ballast, full operating fluids and items in the equipment list over page.

Figure 6-5, Weight and Balance Data Form

EQUIPMENT LIST

The following items of removable equipment are included in the empty weight data from the previous page. The equipment, if installed, becomes part of the empty airplane weight and moment calculation therefore remains in the airplane during the weighing process.

SERIAL No.	REGISTRATION No.	DATE

A) PROPELLER AND PROPELLER ACCESSORIES

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Propeller, Hartzell HC-3BTN-3D/T10282NS		137.0	-41.5
	Spinner Assembly, C-3065-1		14.0	-47.0

B) ENGINE AND ENGINE ACCESSORIES

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Engine, P&WC, PT6A-34		331.0	-9.6
	Starter/Generator, 200SGL129Q-1		21.9	18.0
	Engine Driven Fuel Pump, RG37060D/M		3.3	17.4
	Electric Fuel Pump, 1C54-5		3.3	112.7
	Propeller Overspeed Governor, E210507		3.3	-33.4
	Oil Cooler, L8538233		11.0	24.0
	Fuel Filter Assembly, 1743640-14		2.2	22.2
	Np Tacho Generator, MS25038-4		1.5	-33.4
	Ng Tacho Generator, MS25038-4		1.5	16.6

C) LANDING GEAR AND BRAKES

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Main Wheel Assemblies, 40-179A (2)		50.0	141.4
	Tires, 8.50-10-8TTAH (2)		46.0	141.4
	Inner Tubes, 8.50-10M (2)		6.0	141.4
	Brake Assemblies, 30-182 (2)		6.6	141.4
	Nose Wheel Assembly, 40-140A		5.5	16.4
	Nose Wheel Tire, 8.50-6-6TTAT		12.0	16.4
	Inner Tube, 8.50-6M		2.0	16.4
	Park Brake Valve, 60-10		0.3	44.0
	Brake Master Cylinders, 10-95(4)		2.0	36.7

D) ELECTRICAL EQUIPMENT

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Generator Control Unit, GCSG505-17		2.0	30.0
	Aft Battery, G6381ES		80.0	270.0
	Firewall Battery RG-390E/LS		64	25.09
	Stall Warning Device, C96801		0.2	100.2
	Stall Warning Horn		0.2	89.5
	Overspeed Warning Device		1.4	66.5
	Overspeed Warning Horn		0.2	89.5
	Flap Motor, NP 2446		4.8	172.5
	Post Lights, A350-CN-RD-BK-SH-28(10)		0.6	42.9
	Cockpit Light		0.2	66.5
	Landing Light (2), GE4596		0.8	101.0
	Strobe Power Supply, A413A-HAD-CF-14/28		2.0	243.0
	Strobe/Nav Light Assembly, A600-PG-28		0.8	127.7
	Strobe/Nav Light Assembly, A600-PR-28		0.8	127.7
	Tail Light Assembly, A555A-V-28		0.3	399.6
	Elevator Trim Motor, 409A6021-3		1.1	312.0
	Trim Switch, 402-4319 (2)		0.2	60.2
	Avionics Cooling Fan, ACF528		1.2	36.7
	Heated Pitot Head, 247711-2		1.1	130.7
	IPS Actuator, 2007-0013		1.1	12.0

E) INSTRUMENTS

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Altimeter, 5934PM-3A203		0.9	41.9
	Airspeed Indicator, EA5172-6L		0.7	41.9
	Artificial Horizon, RCA26BK-2		2.3	41.9
	Directional Gyro, RCA15BK-1		2.3	41.9
	Turn and Slip Indicator, 1234T100-3TZ		1.2	41.9
	Compass System KCS 55A		8.7	55.3
	Vertical Speed Indicator, 7030-C103		0.8	41.9
	Course Direction Indicator GI 106		1.4	41.9
	Trim Gauge Cluster, 1U431-005		1.2	41.9
	Encoder, SSD120-30A		0.6	31.0
	Magnetic Compass, C2400-L4P		0.7	39.8
	Torque Gauge, INS60-1		0.8	41.9
	ITT Gauge, INS60-2		0.6	41.9
	Ng Gauge, INS60-3		0.6	41.9
	Np Gauge, INS60-10		0.6	41.9

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Fuel Flow/Fuel Pressure Gauge, INS60-11GPS		0.7	41.9
	Clock, INS60-13		0.6	41.9
	Front Fuel Gauge, INS60-5		0.6	41.9
	Rear Fuel Gauge, INS60-6		0.6	41.9
	Volts/Amps Gauge, INS60-7		0.5	41.9
	Oil Pressure/Oil Temperature Gauge, INS60-8		0.5	41.9
	Outside Air Temperature Gauge, INS60-9		0.5	41.9
	Electronics International Interface Module, DIPM-1		0.6	39.8

F) RADIO EQUIPMENT

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Garmin GPS/NAV/COM, GNS430		6.6	39.8
	Garmin GPS/NAV/COM, GNS530		8.5	39.8
	Garmin Transponder GTX330		4.2	39.8
	Communication Antenna, DMC70 (upper)		0.7	147.0
	Communication Antenna, DMC70 (lower)		0.7	109.5
	Garmin GPS/COM, GNC250XL		3.4	39.8
	Bendix/King ADF KR87		3.2	39.8
	GPS Antenna, GA 56 (2)		1.0	88.3
	Garmin Audio Panel, GMA340		1.6	39.8
	Bendix/King DME KN62A		2.6	39.8
	Stereo PCD7100		2.2	39.8
	Garmin Transponder, GTX327		3.1	39.8
	Transponder Antenna, CI 105		0.3	45.5
	Emergency Locator Transmitter, 455-7063-01		3.3	253.5
	Emergency Locator Antenna, 110-318		0.1	258.0

G) AUTOPILOTS

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	S-TEC 55X Automatic Pilot		11.55	122.73

H) MISCELLANEOUS

ITEM No.	ITEM	MARK IF INSTALLED	WEIGHT (POUNDS)	ARM (INCHES)
	Pilot/Front Passenger Seats and Seat Belts, GA8-251011-11 (2)		44.6	66.5
	First Aid Kit, KIT-A		0.8	66.5
	Fire Extinguisher, FIREEXT .9		2.0	66.5
	Axe		1.5	66.5
	Aircraft Flight Manual		1.5	66.5

6.4 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

The determination of airplane weight and centre of gravity is a simple process with the use of weight and balance tables and forms provided.

WEIGHT

The determination of weight is simply the sum of the airplane basic empty weight (appropriate to the configuration in use) and all additional items of crew, passengers, payload and useable fuel. Copies of the sample forms at Figure 6-7 and Figure 6 -8 should be used to itemize and total the weights and moments of the basic airplane and added items.

CENTRE OF GRAVITY

The centre of gravity determination for the loaded airplane requires knowledge of the moments generated by the individual items of weight. The moment is expressed in inch pounds (in.lbs.) and is the product of weight multiplied by the distance from the datum, in inches at which the item is loaded.

Weight (lbs) x Arm (ins.) = Moment (in.lbs.)

The moment for the basic empty airplane is recorded on the weight and balance record. This figure should be added to the weight and balance loading form shown at Figure 6-7 or the loadsheet shown as Figure 6-8.

The moments for additional items must now be calculated and also added to the weight and balance loading form shown at Figure 6-7 or the loadsheet shown as Figure 6-8.
These calculations are simplified by using the tables at Figures 6-9 and 6-10.

FUEL LOADING

In the left hand column of the table shown at Figure 6-9 select the appropriate quantity of fuel. Reading to the right, determine the weight of the fuel. Moving further right into the column representing the fuel tanks containing the fuel the moment may be read directly from the table. This figure may now be entered on the weight and balance loading form shown at Figure 6-7 or the loadsheet shown as Figure 6-8.

NOTE

For ease of working, the moments on tables and charts are displayed as in.lbs/1000. Care is required to ensure that values are added correctly.

BAGGAGE AND CARGO LOADING

Items of baggage or cargo must also be entered on the weight and balance loading form shown at Figure 6-7 or the loadsheet shown as Figure 6-8. The large cabin of the airplane offers considerable scope for loading cargo items. The weight of these items is multiplied by the arm (in inches from datum) to determine the moment. Figure 6-2 identifies reference stations along the cabins length to assist in the calculation of the arm at which cargo items are loaded. Moments calculated manually in this manner should be divided by 1000, in line with units used on tables and charts in this section.

When all loading items have been recorded on the loading form the weights and moments should be totaled at the bottom of the form shown at Figure 6-7 or the loadsheet shown as Figure 6-8.

The graph shown as Figure 6-6 is used to establish the centre of gravity position of the loaded airplane. Enter the form from the left hand side at the weight which represents the loaded airplane. Move horizontally to the right until this line intersects the diagonal line representing the totaled moments. From the point of the intersection, move down between the (near vertical) guidelines and from the bottom scale read off the centre of gravity position.

Ensure that the calculated weight and centre of gravity are within approved limits. If not, reload and recalculate the weight and balance as required.

LANDING WEIGHT AND CENTRE OF GRAVITY

It is required that the airplane weight and centre of gravity be maintained within limits for the entire flight and not just for the takeoff. In practical terms, and as a minimum, this will require an appreciation of the centre of gravity movement with fuel burn and an estimate of the landing weight based on the planned fuel consumption before landing, on the planned flight.

Landing weight can be determined by subtracting the weight of fuel used to destination, from the takeoff weight. There is provision for this on the weight and balance loadsheet shown at Figure 6-8. By recalculating the total airplane weight and moments based on the landing fuel load, an accurate landing weight and centre of gravity can be determined. In the passenger or cargo role all other items on the loading plan should remain unchanged. In some specialized roles such as parachute operations consideration must also be given to disposable payload which has been disposed of before landing.

EFFECTS OF FUEL BURN OFF ON CENTRE OF GRAVITY

The configuration of the fuel tanks on the standard airplane ensures that the front tanks remain full until all fuel in the rear tanks has been used. It is also required that the front tanks be full before filling rear tanks. Any flight, with full fuel loaded into the tanks, will result in a forward movement of the centre of gravity as fuel is used, until the rear tanks are empty. As fuel is used from the front tanks the centre of gravity movement is dependant on the loading condition of the airplane. At extreme aft loadings the centre of gravity movement will be further aft. At light weights and extreme forward loadings the centre of gravity movement may be slightly further forward.

WEIGHT AND MOMENT LIMITS

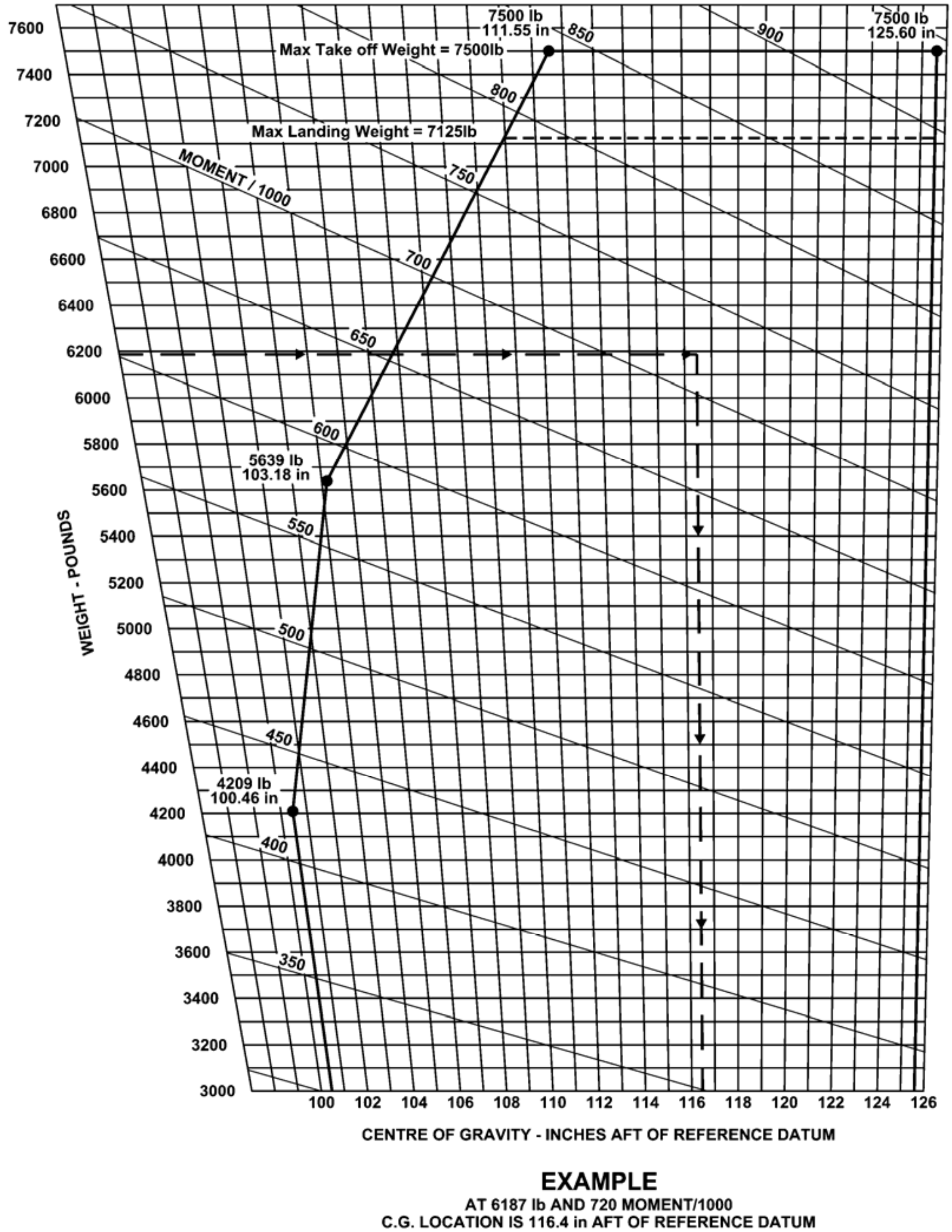

Figure 6-6, Weight and Balance Determination

WEIGHT AND BALANCE LOADING FORM

	WEIGHT	MOMENT (in.lbs)
Basic Empty Weight		
Pilot's Seats		
Cargo/Parachutists		
Cargo/Parachutists		
Cargo/Parachutists		
Cargo/Parachutists		
Cargo/Parachutists		
Cargo/Parachutists		
Cargo/Parachutists		
Cargo/Parachutists		
Front Tank Fuel (Usable)		
Rear Tank Fuel (Usable)		
Other		
Totals	*	*

Figure 6-7, Weight and Balance Loading Form

CAUTION

****Totals must be within approved weight and centre of gravity limits. It is the responsibility of the pilot to ensure that the airplane is loaded properly.***

WEIGHT AND BALANCE LOADSHEET

The weight and balance loadsheet shown in Figure 6-8 is an alternative form to the weight and balance loading form shown in Figure 6-7. The weight and balance loadsheet shown in Figure 6-8 allows the pilot to calculate weight and balance outcomes for all stages of the flight. The sub totals in rows 8 and 10 can be checked using the graph shown as Figure 6-6.

SERIAL No.	**REGISTRATION No.**	**DATE**

PAYLOAD COMPUTATIONS			
ITEM OCCUPANTS OR CARGO	**ARM**	**WEIGHT**	**MOM/1000**
BAGGAGE			
TOTAL PAYLOAD			

REF	**ITEM**	**WEIGHT**	**MOM/1000**
1.	**BASIC EMPTY WEIGHT**		
2.	**PAYLOAD**		
3.	**WEIGHT (LESS FUEL) (sub- total)**		
4.	**FRONT TANK FUEL LOADING**		
5	**REAR TANK FUEL LOADING**		
6.	**RAMP CONDITION (sub-total)**		
7.	**LESS FUEL FOR START AND TAXI**		
***8.**	**TAKEOFF CONDITION**		
9.	**LESS FUEL TO DESTINATION**		
***10**	**LANDING WEIGHT**		

Figure 6-8, Weight and Balance Loadsheet

CAUTION

*****Totals must be within approved weight and centre of gravity limits. It is the responsibility of the pilot to ensure that the airplane is loaded properly.***

FUEL

LITRES	WEIGHT (POUNDS)	FRONT TANKS ARM 110.21 in.	REAR TANKS ARM 139.15 in.
		MOMENT / 1000	
40	70.4	7.76	9.80
80	140.8	15.52	19.59
120	211.2	23.28	29.39
160	281.6	31.04	39.18
200	352.0	38.79	48.98
240	422.4	46.55	58.78
280	492.8	54.31	68.57
284	500.0	55.11	69.58
320	563.2	62.07	-
360	633.6	69.83	-
400	704.0	77.59	-
440	774.4	85.35	-
480	844.8	93.11	-
520	915.2	100.86	-
552	971.5	107.07	-

GALLONS (US)	WEIGHT (POUNDS)	FRONT TANKS ARM 110.21 in.	REAR TANKS ARM 139.15 in.
		MOMENT / 1000	
10	67	7.38	9.32
20	134	14.77	18.65
30	201	22.16	27.97
40	268	29.54	37.29
50	335	36.92	46.62
60	402	44.30	55.94
70	469	51.69	65.26
75	503	55.44	69.99
80	536	59.07	-
90	603	66.46	-
100	670	73.84	-
110	737	81.22	-
120	804	88.61	-
130	871	95.99	-
140	938	103.38	-
146	978	107.79	-

Figure 6-9, Fuel Calculations

OCCUPANTS – PARACHUTE CONFIGURATION

WEIGHT (LBS)	PARACHUTISTS (with parachute)								
	(PILOT) ARM 66.50	ARM 93.00	ARM 107.00	ARM 121.00	ARM 135.00	ARM 149.00	ARM 163.00	ARM 177.00	ARM 191.00
	MOMENT / 1000								
120	7.98	11.16	12.84	14.52	16.20	17.88	19.56	21.24	22.92
130	8.65	12.09	13.91	15.73	17.55	19.37	21.19	23.01	24.83
140	9.31	13.02	14.98	16.94	18.90	20.86	22.82	24.78	26.74
150	9.98	13.95	16.05	18.15	20.25	22.35	24.45	26.55	28.65
160	10.64	14.88	17.12	19.36	21.60	23.84	26.08	28.32	30.56
170	11.31	15.81	18.19	20.57	22.95	25.33	27.71	30.09	32.47
180	11.97	16.74	19.26	21.78	24.30	26.82	29.34	31.86	34.38
190	12.64	17.67	20.33	22.99	25.65	28.31	30.97	33.63	36.29
200	13.30	18.60	21.40	24.20	27.00	29.80	32.60	35.40	38.20
210	13.97	19.53	22.47	25.41	28.35	31.29	34.23	37.17	40.11
215	14.30	20.00	23.01	26.02	29.03	32.04	35.05	38.06	41.07

WEIGHT (LBS)	PARACHUTISTS (with parachute)			
	ARM 195.00	ARM 209.00	ARM 223.00	ARM 240.00
	MOMENT / 1000			
120	23.40	25.08	26.76	28.80
130	25.35	27.17	28.99	31.20
140	27.30	29.26	31.22	33.60
150	29.25	31.35	33.45	36.00
160	31.20	33.44	35.68	38.40
170	33.15	35.53	37.91	40.80
180	35.10	37.62	40.14	43.20
190	37.05	39.71	42.37	45.60
200	39.00	41.80	44.60	48.00
210	40.95	43.89	46.83	50.40
215	41.93	44.94	47.95	51.60

Figure 6-10, Occupants Parachute Configuration

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SECTION 7

DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

TABLE OF CONTENTS

PARAGRAPH		PAGE

7.1 INTRODUCTION

This section describes the airframe, its equipment, controls and systems. Refer to Section 9, Supplements, for details on other supplemental equipment.

7.2 AIRFRAME

GENERAL DESCRIPTION

The airplane is of all metal, riveted, stressed skin construction with a single cantilever low wing and tricycle undercarriage.

The single engine is attached to a welded tubular steel mount. Immediately aft of the firewall is the cockpit section designed to accommodate up to two persons side-by- side with access via hinged doors on either side of the cockpit.

Aft of the cockpit the semi- monocoque construction fuselage provides a main cargo area. The fuselage structure comprises aluminium alloy frames, longerons, stringers and skin panels riveted together to form the monocoque structure.

The empennage comprises a vertical fin, rudder, manually operated rudder trim, horizontal stabilizer, elevator, electrically operated elevator trim with a manual over-ride, dorsal fin and ventral fin.

The wing comprises a centre wing with left hand and right hand outer panels. The wing is a high lift wing with a constant chord, excluding the root extension and a constant aerofoil section. The centre wing has no dihedral whilst the outer panels have a dihedral angle of 8º. An incidence angle of 2º is maintained throughout the span. The centre wing houses the four fuel system storage tanks which are integral with the structure. Mating of the centre wing to fuselage is at the one piece main beam and the split rear beam. The outer panels are attached fore and aft to the centre wing and are terminated at their extremities with fibreglass tips which contain the navigation and strobe lights.

Single slotted flaps are fitted at the trailing edge of the centre wing span. Conventional ailerons with balance tabs on both ailerons and an electrically operated trim on the left hand aileron are attached to the outer panels.

7.3 FLIGHT CONTROLS

GENERAL DESCRIPTION

Conventional manually operated flight controls comprising a rudder, elevator and ailerons are fitted to the airplane. Flight control movement is achieved through movement of a control column in either the left or right pilot position. There is a rudder/aileron interconnect comprising a spring connecting the rudder steering torque tube and control column.

AILERONS

The aileron system comprises cables, quadrants, push rods and torque tubes. Primary stops are located on the wing and secondary stops on the base of the control column. The ailerons are fitted with balance tabs.

An electrically operated trim tab is fitted to the left hand aileron and is operated by left and right movement of a switch on the control column. The trim position is indicated on an instrument in the centre of the instrument panel.

ELEVATOR

The elevator is controlled by fore and aft movement of the control column. Movement of the control column operates the elevator bellcrank by means of tensioned cables running in pulleys. Travel limits are determined by adjustable stops. The primary stops are located in the right hand side of the cockpit wall. The secondary stops are located in the tailcone.

An electric trim tab is fitted on the trailing edge of the elevator and is controlled by fore and aft movement of a switch on top of the control column. A manually operated over-ride trim is provided and is operated by a handle mounted above the pilot's seat position. The trim position is indicated on an instrument in the centre of the instrument panel.

A trim interrupt switch is located in the pedestal in the centre of the cockpit. The red coloured switch when moved forward will isolate electrical power to the elevator trim in the event of an uncommanded movement of the elevator trim. Refer to Section 3 Emergency Procedures in the event of experiencing an elevator trim runaway.

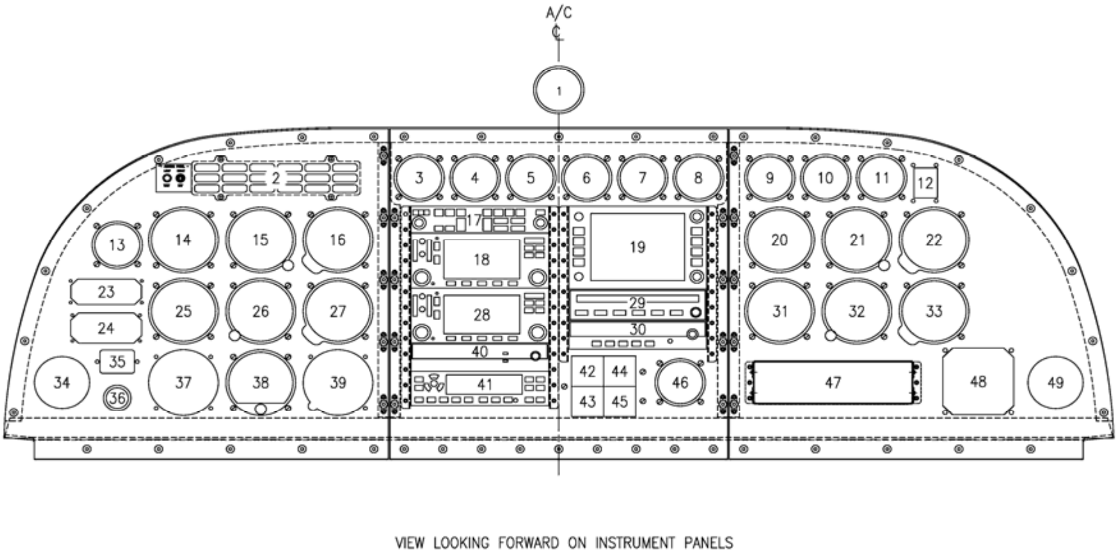
RUDDER

The rudder and nose wheel steering control are linked together at the nose wheel steering tube which is connected to the "pendulum" mounted pedals by adjustable push rods and to the rudder torque tube by tensioned cables. Travel limits are determined by adjustable stops which contact the rudder aft bellcrank and fixed stops on the rudder pedals.

The geometry of the nose wheel steering linkage ensures that the rudder and nose wheel steering are only connected when the airplane is on the ground, i.e. when the nose leg is wholly or partially compressed. As the nose leg extends the steering is progressively reduced, when full extension is reached the nose wheel locks in the centred position and the pedals control the rudder.

A manual rudder trim is fitted and is controlled by movement of a wheel located in the overhead panel above the pilot's seat position. The trim position is indicated in an instrument in the centre of the instrument panel.

7.4 INSTRUMENT PANEL



KEY					
1	Compass	18	GPS VHF NAV/COMM	35	HSI Slaving Control
2	Annunciator Panel	19	Radar	36	Vacuum Indicator
3	Torque Indicator	20	Airspeed Indicator	37	Radio Magnetic Indicator
4	Np Indicator	21	Artificial Horizon	38	Artificial Horizon
5	ITT Indicator	22	Altimeter	39	Radar Altimeter
6	Ng Indicator	23	GPS Annunciator	40	Distance Measuring Equipment
7	Oil Temperature/Pressure Indicator	24	Auto Pilot Annunciator	41	Transponder
8	Fuel Pressure/Flow Indicator	25	Turn and Slip	42	Aileron Trim Indicator
9	Fuel Contents Indicator Front Tanks	26	Directional Gyro	43	Rudder Trim Indicator
10	Fuel Contents Indicator Rear Tanks	27	Vertical Speed Indicator	44	Elevator Trim Indicator
11	Outside Air Temperature Indicator	28	GPS VHF NAV/COMM	45	Flap Indicator
12	Emergency Locator Beacon Switch	29	Auto Pilot	46	Volt/Ammeter
13	Clock	30	Automatic Direction Finder	47	Stereo
14	Airspeed Indicator	31	Turn and Slip	48	Engine Condition Trend Monitoring
15	Artificial Horizon	32	Directional Gyro	49	Cabin Air Vent
16	Altimeter	33	Vertical Speed Indicator		
17	Audio Panel	34	Cabin Air Vent		

Figure 7-1, Instrument Panel Layout and Key

GENERAL

The instrument panel as shown in Figure 7-1 is divided into four general areas; left hand flight panel, right hand flight panel, avionics panel and engine and fuel systems instrument/annunciator panel. The instrument panel includes both standard and optional equipment.

The left hand panel contains the minimum flight instruments required for flight with space to accommodate additional optional instruments and equipment. Refer to Section 9 Supplements for information on any additional equipment fitted.

The avionics panel contains the minimum avionics equipment required for flight with space to fit additional optional equipment. Refer to Section 9 Supplements for details on fitted avionics equipment.

The right hand flight panel is available for fitment of optional flight instruments and equipment. Refer to Section 9 Supplements for details on fitted equipment. A description and the function of instruments and equipment fitted in the instrument panel are contained in the relevant part of this section of the handbook.

ANNUNICATOR PANEL

The annunciator panel is mounted in the instrument panel and provides an indication to the pilot of the status of various airplane systems. The illumination of a green light indicates a safe and normal condition. The illumination of a blue light indicates the operation of a piece of equipment not normally used for normal operations. The illumination of an amber light indicates a cautionary condition which may or may not require immediate corrective action. The illumination of a red light indicates a hazardous condition requiring immediate corrective action. Refer to Section 3 Emergency Procedures for the actions in the event of the illumination of an annunciator panel light requiring corrective action.

The annunciator panel is fitted with day/night dimming capability and a press to test facility. Selecting NIGHT will dim all lights apart from the red coloured lights.

LIGHT DESCRIPTION	COLOUR	MEANING	ACTIONS
Oil Press Low	RED	Engine oil pressure below 25 psi	Refer to Low Oil Pressure emergency checklist
Generator Off	RED	Generator off line	Proceed as for Generator Failure emergency checklist
Low Fuel Level	AMBER	(1) Check fuel contents, if indicating zero fuel there is a maximum of 24 litres (6.3 U.S. gallons, 42 lbs) of fuel remaining for flight. (2) Check fuel contents, if indicating that there is fuel in the tanks a fuel tank jet pump failure has occurred.	Refer Low Fuel Level Light Illuminates emergency checklist
Fuel Filter Bypass	AMBER	Airframe fuel filter has been bypassed	Refer to Fuel filter Bypass emergency checklist
Beta	BLUE	Propeller is set in beta range	Nil
Engine Anti-Ice	BLUE	Inertial separator door lowered	Vacate icing conditions
Door Unsafe	RED	Cargo door unlocked	Refer to Inadvertent Opening Of Airplane Doors In Flight emergency checklist
Chip Detector	AMBER	Engine reduction gearbox contamination	Refer to Engine Gear Box Contamination emergency checklist
Starter Energized	AMBER	Starter in operation	If light remains on after start and attaining 52% Ng select start interrupt.
Ignition On	BLUE	Igniters are operating	Deselect when finished using igniters
External Power	GREEN	External power connected	Ensure external power disconnected and light out prior to taxi
Pitot Heat Inoperative	AMBER	Pitot heat is either selected off, or if selected on the heating element in the pitot heat is defective.	Avoid moisture and icing conditions
Fuel Press Low	AMBER	Mechanical fuel pump pressure has decreased below 6 psi. Light will extinguish when pressure from the electric fuel pump increases system pressure to 9 psi.	Refer Engine Driven Pump Failure emergency checklist
Aux Fuel Pump On	BLUE	Electric fuel pump operating	Refer Engine Driven Pump Failure emergency checklist
Flap Fault	AMBER	The flap asymmetry switches have sensed a fault and isolated the flap motor.	No corrective action possible. Continue flight with flaps at failed position.
Heater Hot	Amber	The temperature sensor under the instrument panel has reached 100ºC	Shut off the heater. Pull the Diffuser Air fully ON. Pull the Cockpit Air control fully ON
Bus Fault	AMBER	Power failure to one of the two electrical buses.	Refer Electrical Bus Failure emergency checklist, Supplement 16.

Figure 7-2, Annunciator Panel Lights Descriptive Details

7.5 FLIGHT INSTRUMENTS

The following flight instruments are capable of being fitted in the instrument panel as either standard or optional equipment.

Airspeed Indicator

Artificial Horizon

Altimeter

Turn and Slip Indicator

Directional Gyro

Horizontal Situation Indicator

Vertical Speed Indicator

Course Direction Indicator

Clock

Outside Air Temperature Indicator

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots. The operating ranges are marked in green, white, yellow and red as detailed in Section 2 Limitations. The pitot static system provides pitot and static pressure to the airspeed indicator. The instrument is internally lit.

VERTICAL SPEED INDICATOR

The vertical speed indicator provides an indication of the rate of climb and rate of descent in feet per minute. The vertical speed indicator is supplied static pressure from the airplane pitot static system. The instrument is internally lit.

ALTIMETER

The altimeter is a barometric type altimeter. The altimeter is fitted with a knob to adjust the instrument's barometric scale to the current barometric altimeter setting. The instrument is internally lit.

ARTIFICIAL HORIZON

The electrically powered artificial horizon displays airplane flight attitude. The electrically driven rotor senses movement in the roll and pitch axis and transmits information to the "pictorial" presentation. Angle of bank index marks are positioned at 10^0, 20^0, 30^0, 45^0 and 90^0 positions either side of wings level. Pitch attitude information is divided into two sections: the upper section is blue and lower section is brown with a white horizon bar between the two. There are pitch index marks both above and below the white horizon line for pitch attitude reference. The airplane symbol is adjustable by a knob at the 6 o'clock position. A "pull to cage" knob is provided to assure immediate alignment and stability whenever power has been applied to the gyro. A power failure flag drops into view whenever the supply voltage is lost or has dropped below a level for proper operation. The instrument is internally lit.

DIRECTIONAL GYRO

The electrically driven directional gyro is a direct reading azimuth indicator. A heading knob is fitted at the 7 o'clock position. A power failure flag drops into view whenever the supply voltage is lost or when the voltage has dropped below a level acceptable for proper operation of the gyro. The instrument is internally lit.

COURSE DEVIATION INDICATOR

The Garmin GI-106A Course Deviation Indicator displays VOR, localiser, glideslope and GPS information. The GI-106A has a VOR/LOC/GPS needle, TO/FROM indicator, NAV warning flag, and a GS needle and flag. The GI-106A has an integral resolver for OBS feedback. The instrument is internally lit.

STANDBY COMPASS

A wet compass is located on the top of the instrument panel coaming to provide magnetic heading information. The compass is internally lit.

OUTSIDE AIR TEMPERATURE INDICATOR

Figure 7-3, Outside Air Temperature Indicator

An Electronics International OAT indicator, as shown in Figure 7-3 is fitted. This indicator has three features that make it a valuable tool when measuring outside air temperatures. The first of these features is its accuracy and linearity. The second feature is the indicator's ability to detect small temperature changes. This provides rate and trend information at a glance. The third feature is the indicator's Ice Zone warning light. This light will come on when the OAT drops to 10^{o}C (50^{o}F) and stays above -10^{o}C (14^{o}F).

NOTE

The OAT indicator resolves outside air temperatures to 1^{o}C (33^{o}F) and is very sensitive to air temperature changes. For this reason, when the OAT probe is in still air and near a heat source, such as hot asphalt or a hangar heater the unit will read the actual temperature to which the probe is subjected. When the engine starts and there is a flow over the probe, the unit will read the air temperature accurately and display changes quickly.

CLOCK

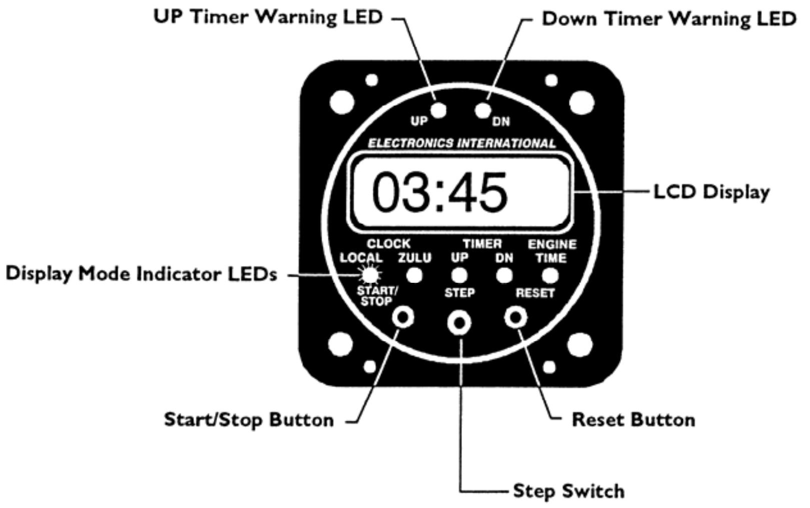


Figure 7-4, Clock

An Electronics International SC-5 clock, as shown in Figure 7-4 is fitted in the airplane. The clock uses a clock IC incorporating a 10 year lithium battery.

The clock has the following five display modes:

LOCAL Clock – In this mode the clock will display local time. The local clock may be programmed to display in a 12 or 24 hour format.

ZULU Clock – In this mode the clock will display zulu time.

UP Timer – In this mode the clock will display the UP timer. This timer counts up and starts automatically when the airplane's BATTERY MASTER switch is turned on. Also a pilot programmable recurring alarm may be set to alert the pilot at appropriate time intervals. Example: If the alarm is set for 30 minutes, an alarm will activate at 30 minutes, 60 minutes, 90 minutes, etc. This alarm can be used to remind the pilot to check fuel levels, course, position or instruments at set time intervals. The yellow warning LED marked UP over the digital display will blink when the programmed time interval is reached. The START/STOP and RESET buttons control this timer.

DN Timer – In this mode the clock will display the DN timer. This timer counts down when running and the start time may be set. When the timer reaches 0:00, the yellow warning LED marked DN over the digital display will blink. The START/STOP and RESET buttons control this timer.

ENGINE TIME – In this mode the clock records the total time the generator is on line. An "/Hr" will be displayed in the upper right corner of the LCD indicating that the time is displayed in hours. The "/Hr" will blink when the clock is recording time. Push and hold the RESET button to display tenths and hundredths of an hour on the timer. This timer cannot be reset.

OPERATING FEATURES AND DISPLAY MODES

During night operation the green LED display mode indicators may be too bright. If so, use the airplane instrument light control to adjust the lighting. The two yellow warning LEDs are always displayed at full intensity.

UP TIMER WARNING LED

The UP timer warning LED located over the digital display blinks when the UP timer reaches the pilot programmed recurring alarm setting or a multiple of this setting. Example: If the alarm is set for 30 minutes, an alarm will activate at 30 minutes, 60 minutes, 90 minutes, etc. Push any button or switch on the clock to stop the blinking and turn off the UP timer warning LED. The UP timer display mode section explains more about the operation of this alarm.

DN TIMER WARNING LED

The DN timer warning LED located over the digital display blinks when the DN timer reaches 0:00. Push any button or switch on the clock to stop the blinking and turn off the DN timer warning LED. The DN timer display mode section explains more about the operation of this alarm.

POWER-UP

When the airplane BATTERY MASTER is turned on, the clock will perform a self-diagnostics test, display “88:88” and flash the yellow warning LEDs. This allows a check of the timer warning LEDs and the LCD display for proper operation.

“LOCAL” CLOCK DISPLAY MODE

By pushing the STEP switch to the right or left, the pilot can select the various display modes. In the LOCAL clock mode, the clock will display local time. In this mode it is possible to set the LOCAL clock to display in a 12 or 24 hour format. In the LOCAL clock display mode an “/Hr” will appear in the upper right corner of the display indicating the display is shown in hours and minutes. Also an “L” will appear in the lower right of the display indicating the LOCAL clock display mode. To set the LOCAL clock see the power-up programming section. To set the format of the LOCAL clock, perform the following steps:

A. Select the LOCAL clock display mode.

B. Momentarily push both the START/STOP and RESET buttons at the same time. The display will show “12:F” or “24:F”.

C. To toggle the display between “12:F” and “24:F” push the STEP switch to left or right.

D. To exit this programming mode, momentarily push both the START/STOP and RESET buttons at the same time.

ZULU CLOCK DISPLAY MODE

Pushing the STEP switch to the right or left selects the various display modes. In the ZULU clock mode the CLOCK will display Zulu time. In this mode "/hr" will appear in the upper right corner of the display indicating that the display is shown in hours and minutes. To set the ZULU clock see the power-up programming section.

UP TIMER DISPLAY MODE

Pushing the STEP switch to the right or left will select the various display modes. In the UP timer mode the clock displays the current time on the UP timer. Push the RESET button to stop the timer and reset the time to 0:00. Push the START/STOP button to toggle the start and stop of this timer. The UP time will start automatically when the airplane BATTERY MASTER switch is turned ON. In this mode the UP time acts as an automatic timer. The UP timer has a pilot programmable recurring alarm. This alarm may be set from 0:00 to 99:59 (minutes: seconds). If the time on the UP timer reaches the recurring alarm setting the yellow UP timer warning LED will blink. Pushing any button on the clock will stop the blinking LED without starting, stopping or resetting the timer. This alarm will reoccur at multiple intervals of the recurring alarm setting. Example: For a setting of 30 minutes, an alarm will activate at 30 minutes, 60 minutes, 90 minutes, etc. This alarm can be used as a reminder to check fuel levels, flight plan, instruments, etc at regular intervals during the flight.

When the UP timer reaches 59 minutes and 59 seconds the display will switch from minutes and second to hours and minutes and an "/Hr" will appear in the upper right corner of the display. An "/Hr" in the display indicates the reading is in hours and minutes; otherwise it is in minutes and seconds.

To programme the recurring alarm perform the following steps while in the UP timer display mode:

A. Momentarily push both the START/STOP and RESET buttons at the same time. The far left digit will blink.

B Select the digit to be programmed – Only the digit that is blinking can be changed. Push the START/STOP button to blink the next digit to the left and push the RESET button to blink the next digit to the right.

C Increase or decrease a blinking digit – Move the STEP switch to the right to increase the blinking digit by one. Move the STEP switch to the left to decrease the blinking digit by one.

D To exit – To exit the UP timer programming mode momentarily push both the START/STOP and RESET buttons at the same time.

DN TIMER DISPLAY MODE

Pushing the STEP switch to the right or left will select the various display modes. In the DN timer display mode the clock displays the current time on the DN timer. Push the RESET button to stop the timer and reset the time to the programmed start time. Push the START/STOP button to toggle the start and stop of this timer.

The DN timer has a pilot programmable start time. The start time may be set from 0:00 to 99:59 (minutes: seconds). For the time set over 59 minutes and 59 seconds the down timer will display in hours and minutes and an “/Hr” will appear in the upper right corner of the display. An “/Hr” in the display indicates the reading is in hours and minutes; otherwise it is in minutes and seconds.

If the time on the DN timer reaches 0:00 the yellow DN timer warning LED will blink. Pushing any button on the clock stops the blinking LED without starting, stopping or resetting the timer.

To programme the start time perform the following steps while in the DN timer display mode:

A. Momentarily push both the START/STOP and RESET buttons at the same time. The far left digit will blink.

B Select the digit to be programmed – Only the digit that is blinking can be changed. Push the START/STOP button to blink the next digit to the left and push the RESET button to blink the next digit to the right.

C Increase or decrease a blinking digit – Move the STEP switch to the right to increase the blinking digit by one. Move the STEP switch to the left to decrease the blinking digit by one.

D To exit – To exit the DN timer programming mode momentarily push both the START/STOP and RESET buttons at the same time.

ENGINE TIME DISPLAY MODE

Pushing the STEP switch to the right or left will select the various display modes. In the ENGINE TIME display mode, the clock displays the total time the generator has been on line. Push and hold the RESET button to display the tenths and hundredths of an hour. The displayed time cannot be reset.

In the ENGINE TIME display mode an “/Hr” will appear in the upper right corner of the display indicating that the display is shown in hours. When the engine timer is running the “/Hr” in the display will blink. The timer will run when the bus voltage is above 26 V for the 24 V system.

POWER-UP PROGRAMMING

During power-up it is possible to enter the power-up programming mode. In this mode the pilot can set the Local and Zulu clock time. To enter the Power-up Programming mode perform the following steps:

A. With the airplane electrical power OFF push and hold both the START/STOP and RESET buttons and then turn the airplane electrical power ON. The far left hour’s digits will blink. An “L” appears in the lower right corner of the display indicating the Local clock. The Local and Zulu clocks are always set in a 24-hour format.

B. Select the digit to be programmed – Only the digit that is blinking can be changed. Push the START/STOP button to blink the next digit to the left and push the RESET button to blink the next digit to the right.

C. Increase or decrease a blinking digit – Move the STEP switch to the right to increase the blinking digit by one. Move the STEP switch to the left to decrease the blinking digit by one.

D. Change functions (Local to Zulu) – To display and set the Zulu time push the RESET button until the “L” in the lower right corner disappears. Use the STEP switch to increase or decrease a blinking digit. To go back to programming the Local time continue to push the START/STOP button until the “L” in the lower right corner of the display appears.

To display and set the minutes lock configuration push the RESET button until a “Loc” or “ULoc” is in the display. Use the STEP switch to toggle the display between “Loc” and “ULoc”. The “Loc” indicates the Zulu and Local minutes will be locked together (i.e. the Zulu and Local minutes will always read the same. If one is changed, the other will automatically change also. If the airplane is operated only in one hour time zones, set the display to “Loc”. In this configuration when the Local time is set to a standard the Zulu time minutes will automatically be set to the correct time. If the airplane is operated in half hour time zones, set the display to “ULoc”. In this configuration the Local and Zulu time work independently of each other.

To go back to programming the Zulu time or Local time, continue to push the START/STOP button until the appropriate display is shown.

To exit the power-up programming mode momentarily push both the START/STOP and RESET buttons at the same time.

7.6 GROUND CONTROL

Ground control is achieved using the rudder pedals which are connected to the nose wheel. Moving the rudder pedals left and right will turn the nose wheel in the natural sense. The turn radius can be reduced with the application of toe brakes in the direction of turn with full rudder pedal applied.

CAUTION

Excessive use of the brakes will cause overheating of the brakes and wheels resulting in premature wear.

7.7 WING FLAPS

The single slotted flaps, which span the centre wing either side of the fuselage are electrically operated and driven. The flaps are extended and retracted by positioning the flap control lever located in the centre pedestal to the appropriate flap selection position. An indicator located in the centre of the instrument panel indicates the flap position. The first flap detent enables selection at $20^0 \pm 1^0$ and with the flap lever fully down 40^0 of deflection is achieved.

The flaps electrical system is protected by two circuit breakers labelled ‘FLAP PWR and FLAP CON” located in the right hand circuit breaker panel or one circuit breaker labelled “FLAPS”.

A red warning light marked FLAP FAULT will illuminate in the annunicator panel when the electrical power supply to the flaps fails.

There is a micro switch in the flap system to detect any flap asymmetry situation. The micro switch will disconnect power from the flap system to prevent further flap asymmetry in the event of a mechanical failure in the flap system.

7.8 LANDING GEAR

The fixed tricycle landing gear comprises two main assemblies attached to the centre wing and a steerable nose assembly attached to the firewall. A shimmy damper is fitted to the nose undercarriage. All units incorporate an oleo pneumatic shock strut. Brakes are fitted to the main assemblies only.

MAIN LANDING GEAR

The main landing gear comprises left and right gear assemblies employing conventional type shock struts which are attached to heavy duty castings forming part of the centre wing structure at the intermediate rib positions.

The strut charging valves pass through the upper skin panels and are accessible from the top of the wing.

Shock strut cylinders are divided into two chambers, the lower chamber in which the piston operates is separated from the upper chamber by a baffle with a metered orifice to control the fluid displaced by the piston movement thus providing the damping effect.

A detachable bearing with inner and outer 'O' ring seals and a scraper ring is located in the base of the lower chamber to act as a guide and provide external sealing for the piston. The scraper ring protects the piston seal from damage that could be caused by foreign material adhering to the exposed portion of the piston.

Steel sockets at the lower end of the pistons provide attachment for the wheel axles and brake anchor plates. The lower arms of the torque links are bolted by brackets to the sockets whilst the upper arms are attached to alloy lugs at the base of the cylinders.

A nylon bumper pad is set into each of the upper arms to contact the pistons and limit their extension when the wheels are clear of the ground.

NOSE LANDING GEAR

The nose landing gear is located between two reinforcing angles on the forward face of the firewall. The shock strut cylinder is longer and is not interchangeable with the main gear shock strut.

The steerable nose wheel is actuated by a steering post and mechanical linkage attached to the piston.

With weight on the nose wheel the linkage assumes a geometric configuration through which direct control of the nose wheel is achieved by rotating the steering post by means of pushrods connecting to the rudder pedals. When weight is removed, as in flight, the linkage extends disengaging the steering, locking the wheel aligned fore and aft freeing the rudder pedal for control of the rudder only.

Bolted to an alloy socket at the base of the piston are the nose wheel fork and the lower portion of the steering linkage, the upper portion of the linkage connects to the steering post which in turn is supported at its lower end to the shock strut cylinder in a trunnion type bearing. The top of the steering post is located in a bearing attached to the rear face of the firewall. A nylon bumper pad is set in the lower portion of the linkage to limit the extension of the piston when the wheel is clear of the ground. In addition as a safety feature in the event of a linkage failure, two cables are connected between the cylinder and the nose wheel fork to prevent the nose wheel separating from the airplane.

WHEEL BRAKES

Brakes fitted to the main gear are hydraulically operated by applying toe pressure to the brake pedals incorporated in the top portion of the rudder pedal assembly. Rotation of either pedal actuates a master brake cylinder resulting in braking action to the disc brake unit on the corresponding wheel. Differential or simultaneous braking action can be achieved as desired.

PARKING BRAKE

A parking brake control knob is located in the pedestal in the centre of the cockpit. The parking brake is set by simultaneously depressing both brake pedals, pulling and holding out the park brake knob, then releasing the brake pedals and finally releasing the park brake knob. The parking brake is released by depressing both toe brake pedals and pushing the parking brake control knob fully in.

7.9 CARGO COMPARTMENT

The baggage/cargo compartment extends from the area immediately behind the pilot and front passenger seats to the rear bulkhead aft of the cargo door. The baggage/cargo compartment floor has provision for passenger seat pick-ups and cargo tie down points. There are three windows on each side of the baggage/cargo compartment. Access to the baggage/cargo compartment is via the entry door on the left hand side of the fuselage behind the trailing edge of the wing.

WARNING

Hazardous material is not to be carried in the airplane. Refer to the relevant regulatory authority for specific rules and regulations.

WARNING

The cargo compartment must be loaded in a manner to ensure the weight and CG limits are not exceeded. Refer to Section 2 for the weight and CG limits and Section 6 for weight and balance details.

7.10 SEATS, SEAT BELTS AND HARNESSES

PILOT AND FRONT PASSENGER SEATS

The pilot and front passenger seat may be moved fore and aft. Moving the seat fore and aft is accomplished by pulling the levers located on the left and right hand side at the rear of the seat fully up to remove the locating pins from the seat slide rail. Move the seat forward or backwards to the desired position while holding the levers fully up. When the desired position is reached release the two levers and gently slide the seat backwards or forwards to allow the locating pins to engage in the nearest hole.

WARNING

The seat is not locked in position unless the locking pin is fully engaged. This can be checked by ensuring the adjusting levers are fully depressed and that fore and aft movement of the seat is not possible.

SEAT BELTS AND HARNESSES

The pilot and front passenger seats are equipped with lap seat belts and shoulder harnesses which are mounted directly on to the seat. The shoulder harness is fitted to an inertia reel unit.

There is a quick release box located on one of the lap seat belts. The other lap seat belt and shoulder harness strap locating lugs locate into the quick release box. To release the lap seat belt and shoulder harness lugs rotate the quick release box in either direction as depicted on the quick release box.

WARNING

Serious or fatal injury could result if the seat belts and shoulder harness are not used correctly.

7.11 DOORS, WINDOWS AND EXITS

PASSENGER/CARGO DOOR

The passenger/cargo door is located on the left hand side of the fuselage behind the wing trailing edge. The door is approximately 48” x 41” and is fabricated from aluminium alloy interlocking panels. The door may be locked, unlocked, opened and closed from both inside and outside. From the outside the door is unlocked by rotating the locking handle on the fuselage adjacent to the door counter clockwise. From the inside the door is unlocked by rotating the handle clockwise. Rotating the handle removes a locating pin at the top of the door allowing the door to slide. The door opens upwards on two tracks. Latches hold the door in the closed position flush with the fuselage skin. A red warning light marked DOOR UNSAFE will illuminate on the annunciator panel when the door is unlocked. Refer to Section 3 Emergency Procedures for actions in the event of inadvertent door opening in flight. To close and lock the door from the outside slide the door closed and rotate the handle clockwise. To lock the door from the inside rotate the locking handle counter clockwise. Ensure the DOOR UNSAFE annunciator light is extinguished.

NOTE

Careful attention is required to ensure the door is closed and locked.

CREW ENTRY DOORS

The airplane is fitted with two gull wing crew entry doors adjacent to the pilot and front passenger seats. These doors are also emergency exit doors. The doors open upwards with assistance of gas filled struts. Both doors pivot on bearing blocks attached to the cockpit closure.

The doors can be opened, closed, locked and unlocked from inside and outside the airplane. To unlock the door from the outside, pull and hold the knob above the handle and rotate the lever downwards. To unlock the door from inside, push the knob behind the handle and rotate the handle towards the pilot's seat. To lock the door from the outside, close the door and rotate the handle backwards and ensure the knob engages. To lock the door from the inside, close the door and rotate the handle forwards towards the instrument panel and ensure the button engages. Refer to Section 3 Emergency Procedures for actions in the event of inadvertent door opening in flight.

CAUTION

Crew entry doors must be closed and locked for flight.

WINDSCREEN

Two blow formed acrylic windscreens are attached to the centre pillar and cockpit composite structure by adhesive and locating screws.

FUSELAGE WINDOWS

Windows are mounted in the crew entry doors and there are three windows on each side of the baggage/cargo compartment. All are made from acrylic sheet attached to the structure by adhesive and locating screws.

7.12 CONTROL LOCK

A control lock capability is provided. The control column lock fits to the left hand control column and lower switch panel and when in place it covers the airplane MASTER switch preventing airplane operation. The control lock is removed and stowed when not in use.

WARNING

Airplane operation should not be attempted with the control lock fitted to the control column.

7.13 ENGINE

GENERAL DESCRIPTION

The airplane is powered by a Pratt & Whitney Canada PT6A-34 750 shaft horsepower free turbine engine, utilizing two independent turbine sections: one driving the compressor in the gas generator section and the second driving the propeller shaft through a reduction gear-box.

Refer to Figure 7-5 for engine component layout.

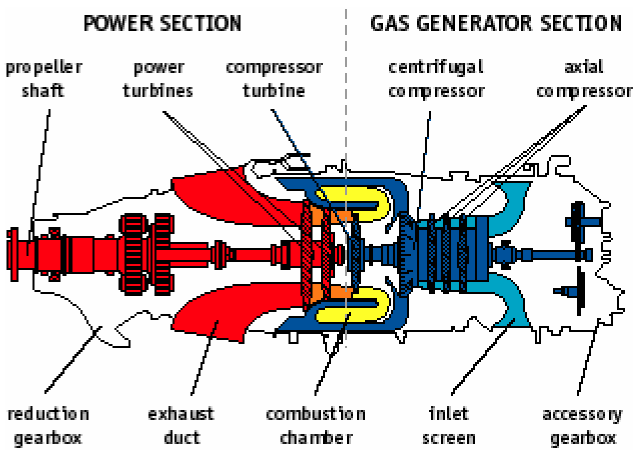


Figure 7-5, Engine Schematic

The air enters the engine through the inlet screen; it is then compressed by a multi-stage compressor and fed to the combustion chamber where it is mixed with fuel and ignited. The hot gas expands through two turbine stages; the first drives the compressor and the accessories; the second, mechanically independent from the first, drives the propeller shaft by means of a reduction gearbox. Finally, the hot gas is discharged through the exhaust ducts.

The engine is self sufficient since the gas generator driven oil system provides lubrication for all areas of the engine, pressure for the torquemeter and power for the propeller pitch control.

Three isolators or shock mounts attach the engine to a tubular steel engine mount assembly which is bolted to the firewall.

The engine is enclosed by detachable upper and lower cowls which are cut-away on the joint line (on both sides) to provide clearance for the exhausts. The upper cowl has a panel which provides access to the oil dipstick and filler. The lower cowl contains an engine air intake and inertial separator at the front of the cowl and NACA ducts for the oil cooler (right hand side rear), ambient air supply to cockpit (ducts left and right forward of the exhaust pipes) and for accessories cooling (left hand side behind exhaust pipe). The cowl halves are held together by 8 lever cowl fasteners.

Vents and drains for components of the engine are provided by pipes and hoses routed overboard from the engine compartment. The 6 pipes are located on the firewall behind the nose wheel.

There is no specific break in procedures for the engine. The performance, reliability and length of life of the engine are dependent on the care and attention given to the engine during operations and maintenance. All engine limitations and operating procedures should be followed and maintenance carried out in accordance with the engine manufacturer's procedures.

ENGINE OPERATION DESCRIPTION

Inlet air enters the engine through an annular plenum chamber, formed by the compressor inlet case, where it is directed forward to the compressor. The compressor comprises three axial stages combined with a single centrifugal stage, assembled as an integral unit.

A row of stator vanes, located between each stage of compression, diffuses the air, raises its static pressure and directs it to the next stage of compression. The compressed air passes through diffuser tubes which turn the air through ninety degrees in direction and convert velocity to static pressure. The diffused air then passes through straightening vanes to the annulus surrounding the combustion chamber liner.

The combustion chamber liner comprises an annular weldment having perforations of various sizes that allow entry of compressor delivery air. The flow of air changes direction through 180 degrees as it enters the combustion chamber and mixes with fuel. The fuel / air mixture is ignited and the resultant expanding gases are directed to the turbines. The location of the liner eliminates the need for a long shaft between the compressor and the compressor turbine, thus reducing the overall length and weight of the engine.

Fuel is injected into the combustion chamber liner through fourteen simplex nozzles arranged in two sets of seven for ease of starting and supplied by a dual manifold comprising primary and secondary transfer tubes and adapters. The fuel / air mixture is ignited by two glow plugs or spark igniters which protrude into the liner. The resultant gases expand from the liner, reverse direction in the exit duct zone and pass through the compressor turbine inlet guide vanes to the compressor turbine. The guide vanes ensure that the expanding gases flow on to the turbine blades at the correct angle, with the minimum loss of energy. The still expanding gases are then directed forward to drive the power turbine.

Refer to Section 3 Emergency Procedures in the event of engine malfunctions.

ENGINE FUEL SYSTEM

DESCRIPTION

The engine fuel system comprises those components that deliver and control metered fuel to the engine combustion chamber with compensation for changes in ambient temperature, compressor discharge pressure and gas generator rpm.

The engine fuel system comprises an oil-to-fuel heater, fuel pump, fuel control unit, flow divider and dump valve, a dual fuel manifold with 14 simplex nozzles, fuel drain valves and interconnecting pneumatic sense lines.

An environmental fuel container is mounted on the firewall and collects fuel drained from the compressor and combustion sections. A valve in the bottom of the container allows the container to be emptied. If the container is not emptied an overflow pipe allows fuel to drain on to the ground.

NOTE

The environmental fuel container should be emptied on a regular basis to prevent fuel draining on to the ground.

OPERATION

In normal operation fuel from the airplane tanks is drawn to the oil-to-fuel heater by the engine driven fuel pump. Heated fuel then flows to the engine driven fuel pump. The fuel pump delivers high pressure fuel to the fuel control unit. The fuel control unit determines the correct fuel schedule for engine steady state operation and acceleration and returns the unused fuel to the pump inlet. Metered fuel exiting the fuel control unit flows to the flow divider which supplies the metered fuel to the primary and secondary manifolds as required. Fuel is then atomized by the 14 simplex nozzles.

ENGINE FUEL SYSTEM COMPONENTS

The following paragraphs describe the details of the major engine fuel system components:

OIL-TO FUEL-HEATER

The oil-to-fuel heater, mounted at the top of the accessory gearbox at the rear of the engine is a heat exchanger which utilises heat from the engine lubricating oil system to preheat the fuel in the fuel system to prevent ice crystal formation. A thermal element reacts to fuel temperature and moves a sliding valve to control the amount of oil flowing into the heat exchanger.

Cold fuel from the airplane fuel system enters the fuel heater and surrounds the thermal element. The thermostatic element contracts and allows oil to travel across the heat exchanger. Heat from the oil transfers to the fuel and fuel temperature starts to rise. At 21^0C (69.8^0F), the thermal element begins to expand and push the sliding valve out. In this position, oil progressively bypasses the fuel heater and fuel temperature begins to stabilise. A spring located at the back of the sliding valve returns it back in (heating position) when fuel temperature drops. During operation, the thermal element constantly reacts to maintain the fuel outlet temperature.

FUEL PUMP

The engine driven fuel pump is a positive displacement gear-type pump, mounted on a pad at the 2 o'clock position on the rear face of the accessory gearbox. The pump provides clean high pressure fuel to the fuel control unit.

Fuel coming from the fuel heater enters the pump housing and passes through the wire mesh screen inlet filter, then through the pump gears. Fuel is filtered a second time through a fibre type outlet filter before being delivered to the fuel control unit via an external flexible hose. The majority of the fuel delivered by the fuel pump towards the fuel control unit is returned back to the pump inlet via an internal cored bypass passage.

FUEL CONTROL UNIT

The fuel control unit determines the correct fuel schedule for engine steady state operation and acceleration and returns the unused fuel to the pump inlet.

The fuel control unit has a number of individual parts which are described in the following paragraphs and are shown on Figure 7-6.

HIGH PRESSURE RELIEF VALVE.

The high pressure relief valve protects the system from over pressure by dumping excess fuel pressure to the pump inlet.

BYPASS VALVE.

The bypass valve regulates the pressure differential (delta P) between pump delivery fuel (P1) and metered fuel (P2) across the ports of the metering valve by returning excess fuel (P0) back to the pump inlet. It comprises a steel plunger moving within a ported steel sleeve. Actuated and supported by means of a diaphragm and spring, it maintains a constant delta P.

METERING VALVE.

The fuel flow metering valve regulates engine fuel burn over a wide range of settings. It travels between a minimum and maximum flow stop. It comprises a steel needle moving within a ported steel sleeve. The position is controlled by pneumatic bellows via a torque tube.

GOVERNOR BELLOWS.

The governor bellows initiate acceleration, deceleration and controls Ng steady state. They are moved by modified P3 air pressure, called Px and Py. To increase Ng, Py is increased. To reduce Ng, Py is reduced.

ACCELERATION (EVACUATED) BELLOWS.

The acceleration bellows are moved by modified P3 air pressure (Px). They are attached to the fuel control unit housing while the rest of the bellows assembly is allowed to move up and down depending on Px and Py pressure and torque tube spring loading. The acceleration bellows control acceleration and deceleration rates in response to Px air variations following changes in Ng.

GOVERNOR LEVER.

The governor lever controls Py bleed off to actuate the governor bellows.

NG GOVERNOR.

The Ng governor controls Ng as a function of the power lever angle. Driven by the accessory gearbox via the fuel pump, the Ng governor flyweights rotate at a speed proportional to compressor speed. The cockpit power lever is linked to the speed-scheduling cam located inside the governor section of the fuel control unit. Movement of the power lever from idle to a higher position increases the tension on the spring and closes the governor bleed to prevent Py from venting to atmosphere. The centrifugal governor flyweights apply a force in the opposite direction to reopen the Py bleed.

INTERCONNECTING COUPLING.

The plastic coupling connects the fuel pump drives to the fuel control unit. It drives the Ng governor.

SPEED SCHEDULING CAM.

The speed scheduling cam is connected to the power lever and it moves the cam follower lever.

CAM FOLLOWER LEVER.

The cam follower lever is contacted by either the idle screw or the Ng scheduling cam. It applies a spring tension to close the governor lever Py bleed.

TORQUE TUBE.

The torque tube transmits the movement of the bellows to the metering valve. The torque tube is torsion loaded towards minimum flow. The bellows are spring loaded towards maximum flow. These tensions will cancel each other; therefore, a very small change in air pressure is able to move the metering valve to the proper setting. It comprises two arms connected together by a coaxial shaft. The inner part of the shaft transmits movements from the bellows to the metering valve and outer bellow shaft exerts a torsion force.

The fuel control unit operates in the starting, acceleration, governing, deceleration and shutdown modes of operation as described in the following paragraphs.

STARTING.

At start, the fuel flow is determined by the engine driven fuel pump rpm and minimum position of the metering valve. The compressor is rotated by the starter until a minimum Ng of 12% is obtained for introducing fuel. Fuel is introduced by moving the fuel condition lever to the

GROUND IDLE position. As the engine accelerates towards idle, compressor delivery pressure begins to move the metering valve away from the minimum stop. As Ng approaches idle, the governor spring forces and opens the governor orifice. This creates a Py-Px differential, which causes the metering valve to move to a floating position to maintain the required Ng idle speed.

ACCELERATION.

As the power lever is advanced above idle, the speed-scheduling cam is repositioned, moving the cam follower lever to increase the governor spring force. The governor spring then overcomes the flyweights and moves the levers, closing the governor valve. Py increases and causes the governor bellows to compress, moving the metering valve towards an increasing fuel flow position. As Ng increases, the acceleration bellows progressively compress and move the metering valve to a more open position. Acceleration is then a function of increasing Px (P3). It is completed when the centrifugal force of the flyweights overcomes the spring tension and opens the governor valve.

GOVERNING.

Once the acceleration cycle has been completed, any variation in engine speed from the selected speed will be sensed by the governor flyweights and will result in increased or decreased centrifugal force. This change in force will cause the governor valve to either open or close, which will then be reflected by the change in fuel flow necessary to re-establish the proper speed. When the fuel control unit is governing, the valve will be maintained in regulating or floating position.

DECELERATION.

When the power lever is pulled back, the speed scheduling lever is rotated to a lower point on the cam. This reduces the governor spring force and causes the governor valve to open. The resulting drop in Py moves the metering valve in the closing direction. As Ng and P3 decrease, the acceleration bellows now expand and progressively move the metering valve to a more closed position until it contacts the minimum flow stop. The engine will continue to decelerate until the governor weight force decreases to balance at the new governing position.

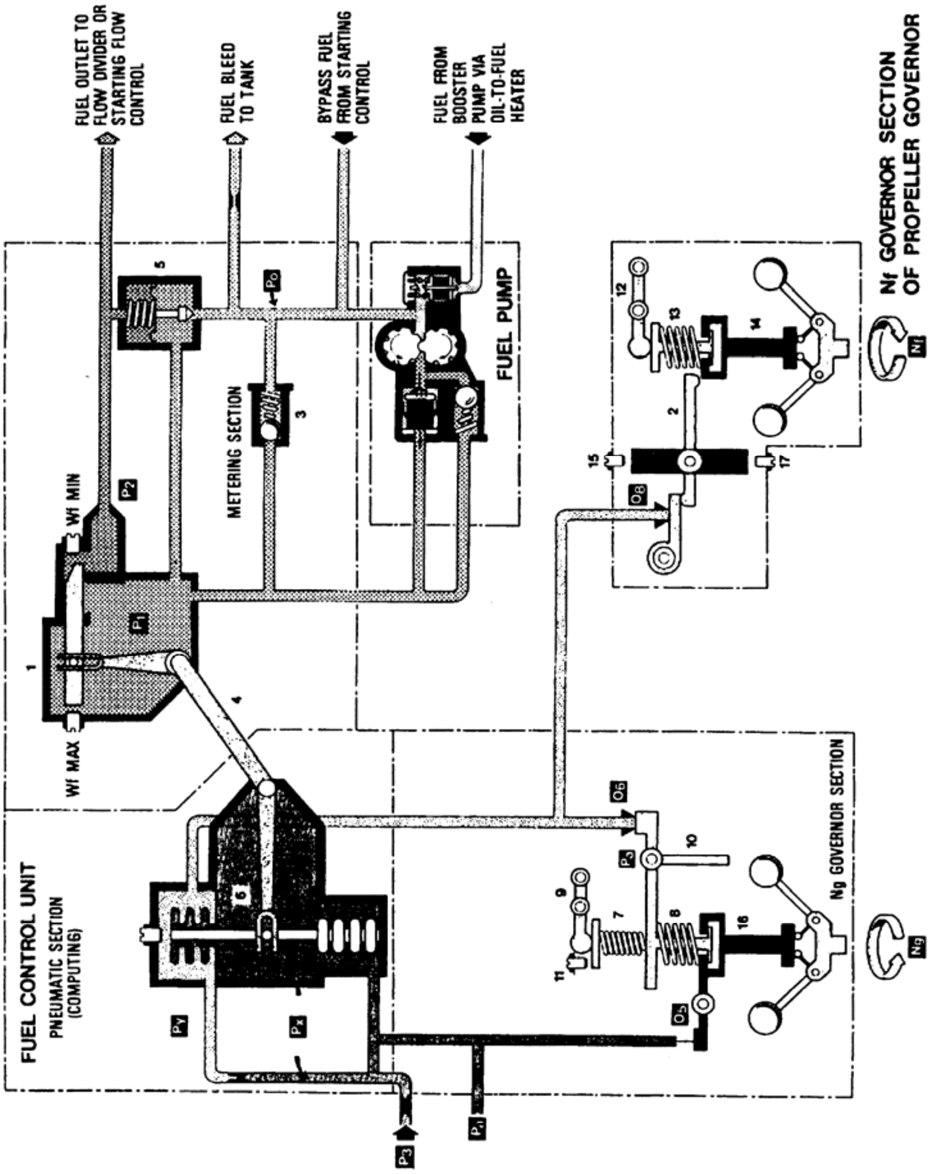
ENGINE SHUTDOWN.

he engine is stopped by moving the fuel condition lever from the GROUND IDLE position to the CUT OFF position. This equalises pressure on both sides of the minimum pressuring valve and its spring causes it to close, cutting flow to the flow divider.

ALTITUDE COMPENSATION.

The compressor surge (stall) margin reduces as altitude increases. Therefore, the acceleration fuel flow must be reduced at altitude to prevent surging. This is achieved by the acceleration bellows. As Px (P3) is a function of engine speed and air density, the pressure will then react by expanding more, reducing fuel flow during acceleration.

Figure 7-6, Fuel Control Unit



LEGEND

1.	Fuel Metering Valve	12.	Speed Set Lever	P_o	Bypass Fuel		
2.	Yoked Bellcrank	13.	Speeder Spring	P_x	Enrichment Fuel		
3.	High Pressure Relief Valve	14.	Platform	P_y	Governing Pressure		
4.	Torque Tube Assembly	15.	Overspeed Adjust	O_5	Enrichment Orifice		
5.	Bypass Valve	16.	Compressor Turbine Governing Platform	O_6	Governing Orifice		
6.	Rod	17.	Underspeed Spring	O_8	Propeller Governor Nf Section Orifice		
7.	Governing Spring	P_a	Ambient Air				
8.	Enrichment Spring	P_1	Unmetered Fuel				
9.	Speed Set Lever	P_2	Metered Fuel				
10.	Link	P_3	Compressor Discharge Air				
11.	Idle Speed Adjust						

FLOW DIVIDER AND DUMP VALVE

The flow divider and dump valve assembly is mounted on the fuel inlet manifold adaptor located at the six o'clock position on the gas generator case.

The flow divider and dump valve divides the fuel flow from the fuel control unit between the primary and secondary fuel manifolds during engine start and operation, and dumps residual fuel from the manifolds at engine shutdown.

During engine start, when the fuel condition lever is moved to GROUND IDLE metered fuel enters the flow divider and pushes against the spring loaded primary valve piston and allows fuel to flow in the primary manifold only, to provide optimum fuel atomisation and lightup characteristics. As Ng speed approaches 35%, fuel pressure increases and the secondary valve also moves against the stop, fuel will then flow to all 14 nozzles. All nozzles are operative at idle and above.

When the fuel condition lever is moved to the CUT OFF position, fuel pressure ends and the two springs push the primary and secondary valves towards the closed position, allowing fuel to drain by gravity into the environmental collector tank mounted on the firewall in the seven o'clock position. This prevents deposit formation in the manifolds and fuel nozzles.

FUEL MANIFOLD AND NOZZLES

The dual fuel manifold delivers metered fuel from the flow divider to the primary and secondary fuel nozzles. The manifold comprises 14 adaptor assemblies (10 primary and 4 secondary). The adaptors are interconnected by pairs of fuel transfer tubes and are each secured to their respective bosses on the gas generator.

Each fuel manifold adaptor incorporates a simplex, single orifice fuel nozzle, with swirl-type tip and sheath. The swirl-type tips provide a fine atomised fuel spray in the annual combustion chamber liner. They are positioned so that they produce a tangential spray from one nozzle to the next in the liner. Holes in the sheath allow cooling air, from the space between the gas generator case and liner, to pass within the sheath and out through the nozzle aperture; this air, in addition to cooling the tip of the nozzle, also assists in fuel atomisation.

ENGINE LUBRICATION SYSTEM

GENERAL DESCRIPTION

The engine lubrication system comprises an oil pump, integrally formed oil tank with the filler cap incorporating a dipstick, ports for the temperature and pressure sensing probes, an oil filter, chip detector and warning system, together with an airframe mounted oil cooler.

Refer to Figure 7-7 for engine lubrication system schematic.

The lubrication system provides a constant supply of clean oil to the engine bearings, reduction gears, accessory drives, torquemeter and propeller governor. The oil tank is integrated in the engine air inlet casing. The oil lubricates and cools the bearings and carries extraneous matter to the oil filter where it is precluded from further circulation. The oil is also an anti corrosion agent for the steel bearings and gears. A chip detector is located in the reduction gearbox to detect metal particles and warn of metal contamination.

To avoid overfilling of oil tank, and high oil consumption, an oil level check is recommended within 10 to 20 minutes of engine shutdown. Graduations on the dipstick indicate the oil level in U.S. quarts below maximum capacity of the oil tank.

The system comprises a pressure system, scavenge system, and a breather system.

PRESSURE OIL SYSTEM

Oil is drawn from the oil tank and pumped through a gear type pump and is then delivered to the oil filter. At the filter outlet oil separates into several paths.

The Number 1 bearing and accessory input drives are lubricated with pressure oil directed through cored passages and transfer tubes.

A single tube located at the bottom right hand side of the engine delivers oil to lubricate the Number 2,3 and 4 bearings, the reduction gearbox, front accessories and supply the propeller system.

SCAVENGE OIL SYSTEM

The scavenge oil system returns used oil back to the tank. It comprises two oil sumps, one in the accessory gearbox, and one in the reduction gearbox. The sumps allow the oil to be collected and de-aerated before it returns to the tank.

Four gear type pumps assembled in two double elements form the scavenge system. Two pumps are located inside the accessory gearbox, the other two are mounted externally at the left rear side of the accessory gearbox.

Number 1 bearing scavenges into the secondary gearbox by gravity. Number 2 bearing scavenges through an external tube mounted underneath the engine. At high power a relief valve mounted at the Number 2 bearing scavenge pump inlet allows air/oil from the bearing cavity to bleed into the accessory gearbox, preventing flooding of the Number 2 bearing cavity.

Number 3 and 4 bearing area scavenges into the accessory gearbox via a scavenge tube mounted on the left hand side of the engine. Oil is scavenged by one of the pumps located at the rear of the accessory gearbox.

The reduction gearbox and the propeller system oil scavenge through an external tube located along the Number 3 and 4 bearing scavenge tube. The oil is pumped by the externally mounted scavenge pump and goes directly to the airframe oil cooler.

Oil from the accessory gearbox sump (from Numbers,1,2,3 and 4 bearings) is returned to the oil cooler by a scavenge pump located at the bottom of the accessory gearbox.

BREATHER SYSTEM

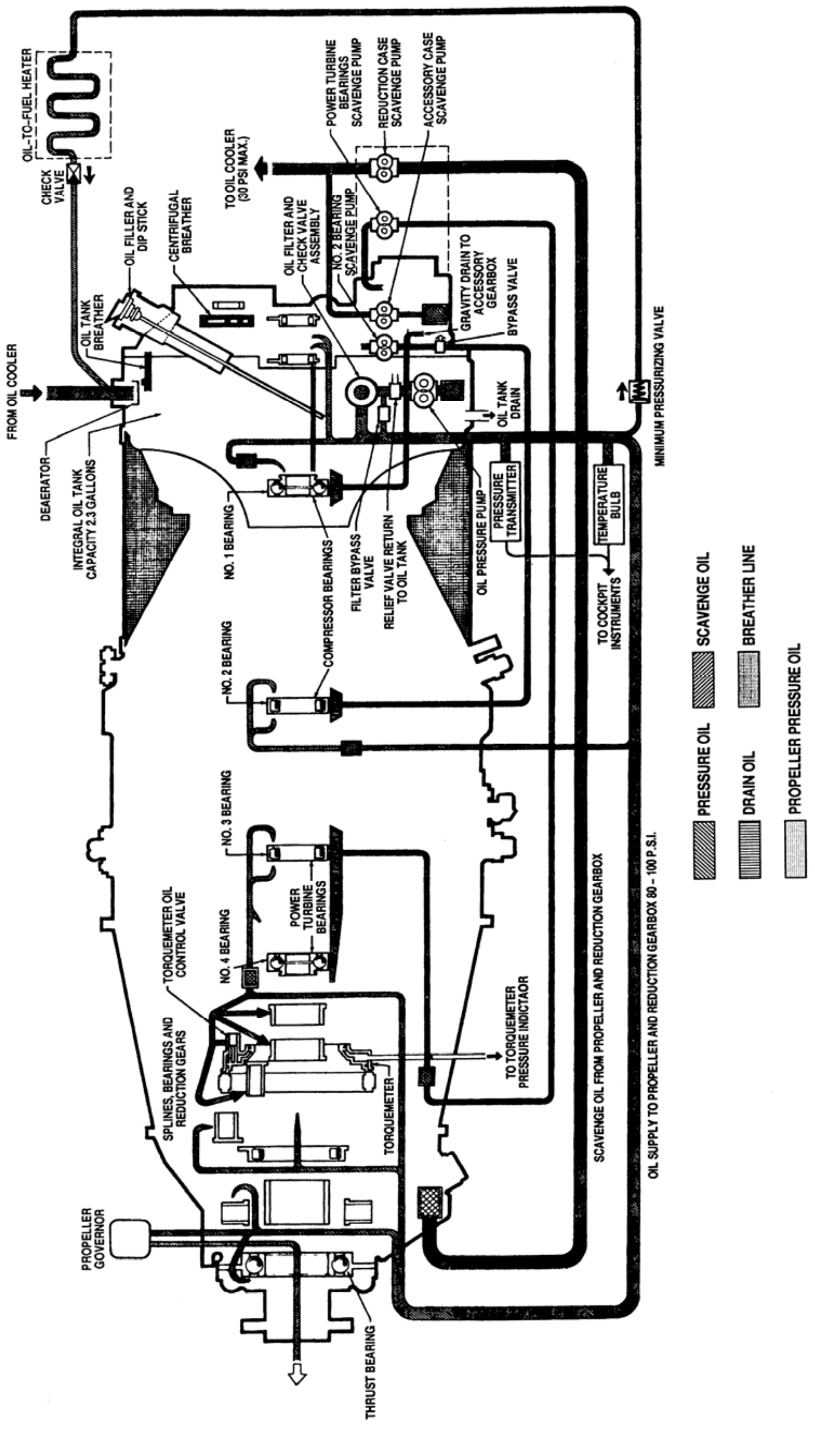
Breather air from the engine bearing compartments and from the accessory and reduction gearboxes is vented overboard via the centrifugal breather installed in the accessory gearbox and the drain pipe adjacent to the nose wheel.

The Number 1 bearing compartment vents rearward into the accessory gearbox and the Number 2 bearing compartment is vented via the scavenge oil transfer tube. A by-pass valve, immediately upstream of the front element of the internal scavenge pump, allows oil and air to be vented into the accessory gearbox under certain transient operating conditions to prevent over pressurising the Number 2 bearing area. Under normal operating conditions, the valve is closed to prevent oil flooding back into the tube assembly. The Number 3 and 4 bearing compartments and the reduction gearbox areas are vented to the accessory gearbox and oil tank respectively through their scavenge oil lines. The oil tank is vented to the accessory gearbox through the anti-flooding arrangement installed in the oil tank.

OIL PUMP

Pressure oil is circulated from the engine's integral oil tank through the engine lubricating system by a self contained gear type pump mounted at the bottom of the oil tank. The oil pump comprises two gears contained in a cast housing bolted to the front of the accessory gearbox diaphragm. The pump gears are driven by an accessory gear-shaft which also drives the internal scavenge pump. A removable inlet screen is fitted at the oil pump. The pump housing incorporates a support boss at the pump for the oil filter housing, and is counterbored to accommodate the check valve which is mounted at the inner end of the filter housing. The lubrication system pressure relief valve is installed on a pad located at the upper end of the housing. An internal cored passage connects the relief valve to pump outlet.

Figure 7-7, Engine Lubrication Schematic



AIR INDUCTION SYSTEM

Air is supplied to the engine compressor through the air intake in the front of the lower cowl.

The air induction system comprises an air intake and an inertial separator.

AIR INTAKE

The engine air inlet is located at the front of the engine nacelle below the propeller spinner. Ram air entering the inlet flows through ducting and an inertial particle separator system and then enters the engine through a circular plenum chamber where it is directed to the compressor by guide vanes. The compressor air inlet incorporates a screen which will prevent entry of large articles, but does not filter the inlet air.

INERTIAL SEPARATOR

An inertial separator system in the engine air inlet duct prevents moisture particles from entering the compressor air inlet plenum when in the bypass mode. The inertial separator comprises two movable vanes and a fixed airfoil which, during normal operation, route the inlet air through a gentle turn into the compressor air inlet plenum. When separation of moisture particles is desired, the vanes are positioned so that the inlet air is forced to execute a sharp turn in order to enter the inlet plenum. This sharp turn causes any moisture particles to separate from the inlet air and discharge overboard through the inertial separator outlet in the lower cowling.

Inertial separator operation is controlled by a switch located on the switch panel marked IPS. The switch has two positions, NORM/NORMAL and BYPASS In the NORM/NORMAL position the door remains retracted. Actuation is by an electric actuator mounted in the lower engine cowling. When the inertial separator door is lowered (BYPASS position) a blue annunciator panel light marked ENGINE ANTI ICE will illuminate.

INLET AIRFLOW MODULATION

The compressor bleed valve, located on the gas generator case, automatically opens a port in the gas generator case to spill inter-stage compressor air (P2.5) and provide anti-stall characteristics for the compressor. The bleed valve remains closed at higher gas generator speeds.

ENGINE CONTROLS

DESCRIPTION

The single quadrant housing the engine controls is located in the centre of the airplane cockpit under the instrument panel and is accessible from the left and right seats. The power lever and fuel condition lever control the engine and the propeller lever controls propeller speed and feathering. The levers are provided with an adjustable friction damper and are connected by push-pull cables to their respective engine components.

POWER LEVER

The power lever is used to control the compressor speed and to control the propeller pitch in reverse. The power lever is connected to a cam-cluster located on the accessory gearbox via push/pull cables. The cam transmits power lever movement to the fuel control unit which modifies the fuel flow to the engine and Ng speed. In the forward operation mode, the power lever controls Ng speed only and has no effect on the beta valve. From idle, minimum power position, to the full reverse position, the power lever increases Ng and moves the beta valve to change the propeller blade angle towards the reverse position.

CAUTION

To avoid mechanical damage to the propeller linkage the power lever must not be moved into the reverse position when the engine is not operating.

PROPELLER LEVER

The propeller lever is connected to the speed lever on the top of the constant speed unit. The propeller lever controls the propeller speed in the governing mode and allows the pilot to feather the propeller on the ground prior to engine shutdown of the engine or during flight, in the event of an engine malfunction.

FUEL CONDITION LEVER

The fuel condition lever is connected to the start flow control unit. The fuel condition lever has three positions, CUT OFF, GROUND IDLE and FLIGHT IDLE. In the CUT OFF position fuel flow to the engine is cut off. When in the GROUND IDLE position a modulated fuel flow is provided for engine starting.

In the GROUND IDLE position the fuel supplied to the engine is sufficient for normal flight. Selection of the FLIGHT IDLE position will provide greater fuel input and result in improved engine acceleration. FLIGHT IDLE is recommended for normal operations.

QUADRANT FRICTION

A friction control is provided on the side of the power quadrant to allow the pilot to alter the resistance on the power lever, propeller lever and fuel condition lever.

ENGINE INDICATING SYSTEMS AND INSTRUMENTS

TORQUE INDICATING SYSTEM

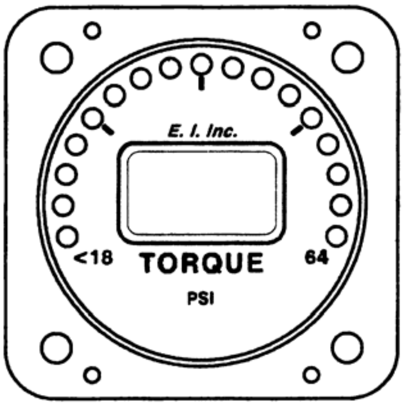


Figure 7-8, Torque Indicator

The engine torquemeter system comprises an indicator, a transmitter, torquemeter (engine), rigid pipes, flex hoses and a restrictor union.

Rigid pipes (routed along the engine) and flex hoses connect the transmitter to a restrictor union in the outlet port of the torquemeter which is located in the forward upper right hand face of the gearbox housing and a balance gearbox case fitting in the forward upper left face of the gearbox housing.

Torque reaction between gears in the power transmission train is applied to the torque meter, which transmits the force as pressure oil to the transmitter which sends an electrical signal to the indicator

The Electronics International electronic pressure indicator as shown in Figure 7-8 is mounted in the instrument panel. The dial of the indicator is graduated in pounds per square inch. The torque indicator comprises a digital and an analogue display. The analogue display comprises green lights signifying the normal operating range, yellow lights signifying that the torque is above the maximum continuous limit and a red light indicating that the torque has exceeded the maximum limit. The display may be dimmed using the airplane lighting controls; however, the red light will always be displayed at full intensity.

The analogue display lights provide a visual indication of the current operating torque and where this is in respect to the various ranges. The digital display provides torque indications in 1 psi increments.

CAUTION

The digital display should be used for precise torque indications.

INTER TURBINE TEMPERATURE (ITT) SYSTEM AND INDICATOR

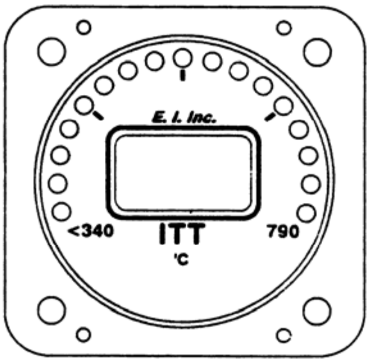


Figure 7-9 ITT Indicator

The Inter Turbine Temperature (ITT) indicating system provides an indication of the engine operating temperature occurring in the zone between the compressor turbine and the power turbine stator.

The ITT system comprises an indicator, a harness (includes a thermocouple and alumel and chromel wires) and resistor block

The indicator as shown in Figure 7-9, is a milli-volt meter and is mounted in the instrument panel. The dial of the indicator is graduated in degrees centigrade. Alumel and chromel wires (harness) connect the indicator via a resistor block mounted on the firewall.

The harness generates a milli-voltage in proportion to the temperature and passes this signal to the resistor block which measures the difference in resistance and then sends the resultant signal to the indicator.

The green analogue lights signify the ITT is in the normal operating range and the red light indicates that 790^{o}C has been exceeded. The digital display provides ITT indications in 1^{o}C increments.

CAUTION

The digital display should be used for precise ITT indication.

GAS GENERATOR RPM INDICATOR

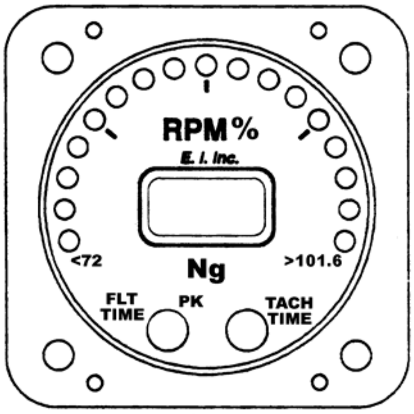


Figure 7-10, Gas Generator RPM Indicator

The gas generator indicating systems comprises an indicator, a circuit breaker, a tachometer generator (engine component) and associated wiring.

The Ng tachometer generator produces an electric current which is used in conjunction with the gas generator indicator to indicate gas generator speed as a percentage. The Ng tachometer generator drive and mount are located on the accessory gearbox.

The Electronics International R-1 indicator, as shown in Figure 7-10 is graduated as a percentage of the rotational speed of the gas generator turbine and is located in the centre of the instrument panel. The Ng indicator incorporates a 210^0 analogue display and a digital display. There are no moving parts (needles, bearings and springs etc) in the indicator. The internal microprocessor provides accuracy and repeatability.

ANALOGUE DISPLAY

The 210^0 analogue display provides a quick reference of the Ng with respect to the operating range. The red (maximum limit) and green (normal operating range) analogue lights provide a visual indication of the current operating range. The red light will blink 20 times at full intensity when the maximum limit is exceeded. After 20 blinks the red light will stop blinking and display a continuous red light. The digital display will continue to provide readings beyond the red light limit. The analogue lights may be dimmed using the airplane lighting controls; however, the red light will always be displayed at full intensity.

DIGITAL DISPLAY

The digital display provides Ng information as a percentage in tens, units and to one decimal place.

CAUTION

The digital display should be used for precise Ng indication.

TACH TIMER

The tach timer keeps a running total of time the engine is above 45%. The time is stored in the indicator's memory for life. To display the time on the tach timer in thousands of hours, press the right push button marked TACH TIME and hold the button in. The digital display will show two digits which represent thousands of hours on the tach timer. To display the hundreds, tens, units and 1/10 hours on the tach timer release the TACH TIME button for no more than two seconds and press it again and hold it in. The display will show four digits with a decimal. The digits represent hundreds, tens, units and 1/10 hours on the tach timer. Each time the TACH TIME button is pushed and held in the display will toggle between the two displays. If the TACH TIME button is released for more than three seconds the display will revert back to Ng.

FLIGHT TIMER AND PEAK RPM

The indicator includes an automatic timer. When Ng reaches or exceeds 65% for 10 seconds, the flight timer will reset to "00.00" and start timing in one minute increments. The peak Ng register will also reset to "0000". The flight timer will continue to count until the Ng drops below 65% for 10 seconds. At this point the flight time and peak Ng will be stored in the memory. There are no internal batteries in the indicator and bus power is not required to keep the memory alive. The last flight time and peak Ng will always be available even if the power is turned off.

As the flight timer is counting, the maximum Ng is also being recorded. For a Ng to be recorded as peak it must exceed the last recorded Ng for three seconds or longer.

To display flight time press the button marked FLT TIME and hold it in. The digital display will display the flight time in hours and minutes.

To display the highest Ng reached during the flight release the FLT TIME button for no more than two seconds and press it again and hold it in. The digital display will show the peak Ng reached during the flight. Each time the FLT TIME button is pushed the display will toggle between flight time and peak Ng. If the FLT TIME button is released for more than three seconds the display will revert back to Ng.

FUEL SYSTEM INDICATOR

DESCRIPTION

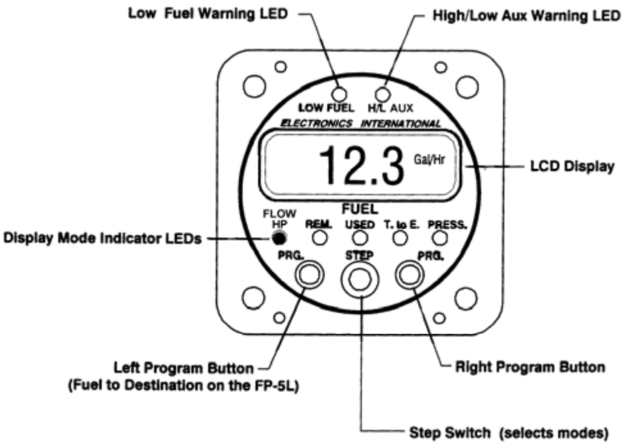


Figure 7-11, Fuel system indicator

Engine fuel pressure and flow are displayed on an Electronics International FP-5 digital indicator, as shown in Figure 7-11 mounted in the centre instrument panel. Pressure is sensed by a transducer mounted on the firewall which transmits an electrical signal to the indicator. Flow is sensed by a transducer mounted on the firewall in the engine entry line.

The fuel system indicator has the following main display modes; fuel flow (FLOW), fuel remaining (REM), fuel used (USED), time to empty (T to E) and an auxiliary channel (AUX) which displays fuel pressure.

In addition to the display modes detailed above the following pilot programmable settings (used to set up the display and alarms) are available; display in U.S. gallons, Imperial gallons, pounds or litres, fuel remaining, two low fuel alarms, time to empty alarm, re-occurring fuel used alarm, high and low aux alarm. There are also power-up programmable settings that are used to configure the instrument for personal preferences, airplane and engine.

WARNING

The fuel remaining displayed by the fuel system indicator is not a measurement of the fuel in the tanks. It is an amount calculated from the starting fuel level manually programmed into the fuel system indicator by the pilot minus the fuel used. When properly calibrated, the fuel system indicator can accurately measure the fuel used. It is imperative the pilot verify the calibration of the fuel system indicator over many tanks of fuel before using the REM and/or USED modes as an indication of the fuel in the tanks or fuel used. Even after verifying the calibration of the fuel system indicator it should never be used as the primary indicator of fuel quantity in the tanks. It is important the pilot visually check/measure the fuel quantity for each tank before takeoff and cross check these readings against the fuel quantity indicators and the fuel system indicator.

CAUTION

The accuracy of the displayed fuel flow is affected by the value of the K Factor. The K Factor sets the calibration of the instrument to match the flow transducer and the variations in the installation. The differences between the flow transducers, elbows, fittings, pipe sizes, hoses and routing methods used during installation for any fuel flow instrument can cause the flow transducer to output different electrical pulses per unit measurement, called K Factor than when it was tested at the factory. The accuracy of the fuel flow indications will also be affected if the pilot switches the units from the units that the K Factor was calibrated to read. Refer to the fuel system indicator Installation Instructions Manual for further detail on setting the K factor.

NOTE

The use of the fuel system indicator does not eliminate or reduce the necessity for the pilot to use good flight planning, pre-flight and in-flight techniques for managing fuel.

DISPLAYS, WARNING, LEDS AND ALARMS

During night operation the green LED display mode indicators may be too bright. The LED lights can be dimmed using the airplane instrument lighting controls. The two red warning LEDs will always be displayed at full intensity.

LOW FUEL WARNING LED

There are four pilot-programmable alarms that will blink the red low fuel warning LED (LOW FUEL) when violated. The following describes how each alarm affects the low fuel warning LED:

First Low Fuel Alarm:

This alarm should be set as a reminder. When the alarm limit is violated the red low fuel warning LED (LOW FUEL) will start to blink. Pushing any button or switch on the fuel system indicator will stop the blinking and turn off the warning LED. Also a bar in the upper left corner of the display will be shown when displaying REM.

Second Low Fuel Alarm:

This alarm should be set as a warning. When the alarm limit is violated the red low fuel warning LED (LOW FUEL) will blink. Pushing any button or switch on the fuel system indicator will stop the blinking and the LED will remain illuminated red. Also a bar in the lower left corner of the display will be shown when displaying REM.

Time to Empty Alarm:

This alarm may be set for a time to empty value (example: 1 hour). When the fuel flow and fuel remaining results in less than one hour of fuel on board (as per example), the alarm limit is violated and the red low fuel warning LED (LOW FUEL) will start to blink. Pushing any button or switch on the fuel system indicator will stop the blinking and turn off the warning LED. Also a bar in the upper left corner of the display will be shown when displaying T to E.

. **Re-occurring Fuel Used Alarm**:

This alarm may be set for a fuel used value (example: 50 litres/gallons). If the alarm was activated with 200 litres of fuel remaining, there will be an alarm at 150, 100 and 50 litres/gallons of fuel remaining in the tank. This feature may be used to remind the pilot to check the fuel levels at set intervals. When the alarm limit is violated the red low fuel warning LED (LOW FUEL) will blink. Pushing any button or switch on the fuel system indicator will stop the blinking and turn off the warning LED.

Refer to the Pilot Programmable Modes of this section to set the alarms

HIGH/LOW AUX WARNING LED

There are pilot programmable high and low alarm limits that blink the red H/L AUX warning LED when violated. Pushing any button or switch on the fuel system indicator will cause the LED to stop blinking and remain illuminated red. If the high limit is violated, a bar in the upper left corner of the display will be shown when displaying AUX. If the low limit is violated, a bar in the lower left corner of the display will be shown when displaying AUX. See the Pilot Programmable Modes section to set the alarm limits.

POWER-UP

When the airplane BATTERY MASTER switch is turned ON, the fuel system indicator will perform a self-diagnostics test and flash the red warning LEDs. This allows a check of the warning LEDs for proper operation.

After power-up, the fuel system indicator will blink the REM (fuel remaining) LED and display the fuel calculated remaining in the tank(s) based on the settings previously programmed into the fuel system indicator by the last user. The REM LED will continue to blink until any button or switch is pushed. The blinking REM LED is intended as a reminder to update the fuel system indicator if the fuel load has been altered since the last flight (see REM Display Mode).

WARNING

The fuel remaining displayed by the fuel system indicator is not a measurement of the fuel in the tanks. It is an amount calculated from the starting fuel level manually programmed into the FUEL SYSTEM INDICATOR by the pilot, minus the fuel used.

DISPLAY MODES AND OPERATING FIGURES

Figure 7-12 details the display modes on the fuel system indicator:

	Display Mode (indicated by a green LED)				
	FLOW	**REM**	**USED**	**T. to E.**	**AUX**
Main Display (select with STEP switch)	Fuel Flow	Fuel Remaining	Fuel Used Since Last Programmed	Time to Empty	Pressure
Alternate Display (push either PRG button)			Fuel Used For The Flight		

Figure 7-12, Display Modes and Operating Features

“FLOW ” DISPLAY MODE

When in the FLOW mode fuel flow is configured to display as follows:

A. When set to display in U.S gallons the display will read in .1 gallons/hour increments up to 199.9 gallons/hour.

B. When set to display in Imperial gallons the display will read in .1 gallons/hour increments up to 162.0 gallons/hour.

C. When set to display in pounds the display will read in 1lb/hour increments up to 1199 lbs/hour.

D. When set to display in litres the display will read in 1 LPH increments up to 749 LPH.

Special algorithms in the microprocessor are used to ensure a quick response and a stable display.

REM (REMAINING) DISPLAY MODE

In the REM (fuel remaining) display mode the fuel system indicator will display the fuel quantity remaining as follows:

A. When set to display in U.S. gallons the display will read in .1 gallon increments up to 99.9 gallons and 1 gallon increments from 100 to 999 gallons.

B. When set to display in Imperial gallons the display will read in .1 gallon increments up to 99.9 gallons and 1 gallon increments from 100 to 811 gallons.

C. When set to display in pounds the display will read in 1 lb increments up to 1999 lbs.

D. When set to display in litres the display will read in 1 litre increments up to 1999 litres.

If the first low fuel limit is violated, a bar in the upper left corner of the display will appear when this mode is selected. If the second low fuel limit is violated, a bar in the lower left corner of the display will appear when this mode is selected. See the Pilot Programmable Settings section to set the two low fuel limits.

WARNING

The fuel remaining displayed by the fuel system indicator is not a measurement of the fuel in the tanks. It is an amount calculated from the starting fuel level manually programmed into the fuel system indicator by the pilot, minus the fuel used.

WARNING

While in flight the fuel system indicator readings should only be used to cross-check the fuel contents indicators, calculations of the fuel onboard from flow rates specified in the specifications for the airplane and calculations of the fuel onboard from flow rates that were measured from previous flights. The use of the fuel system indicator does not eliminate or reduce the necessity for the pilot to use good flight planning, pre-flight and in-flight techniques for managing fuel.

CAUTION

The K Factor programmed into the fuel system indicator will affect accuracy of the fuel remaining. See the Installation Manual for further details.

TO ADD FUEL

If fuel is added to the airplane set the fuel system indicator REM value for the fuel remaining shown on the fuel system indicator plus the fuel added to the tank(s). If the tank(s) have been filled set the fuel system indicator REM value for the total fuel in the tanks. It is important to verify the fuel levels in the tanks before takeoff.

To change the fuel remaining shown on the fuel system indicator perform the following steps:

A. Select the REM display mode (this mode is displayed during power up).

B. Momentarily push both PRG buttons at the same time. The display will blink “Add”.

C. Push either one of the PRG buttons. The display will show the current fuel remaining. The blinking left digit indicates that this digit may be programmed.

D. Set the fuel remaining level using the following procedure:

a) Select a digit – The right and left PRG buttons move the blinking digit to the right or to the left.

b) Increase or decrease a digits count – Moving the STEP switch to the right will increase the blinking digits count and moving it to the left will decrease the blinking digits count.

c) Exit – To exit the add fuel mode momentarily push both PRG buttons at the same time. The programmed value will be stored in memory and no internal batteries or external power are required to store this information for life.

USED DISPLAY MODE

In the main USED display mode the fuel system indicator will display the fuel used since the fuel system indicator was last programmed. Pushing either PRG button will display the fuel used on the flight. The fuel used is displayed as follows:

A. When set to display in U.S. gallons the display will read in .1 gallon increments up to 99.9 gallons and 1 gallon increments up to 999 gallons.

B. When set to display in Imperial gallons the display will read in .1 gallon increments up to 99.9 gallons and 1 gallon increments up to 811 gallons.

C. When set to display in pounds the display will read in 1 lb increments up to 1999 lbs.

D. When set to display in litres the display will read in 1 litre increments up to 1999 litres.

CAUTION

The K Factor programmed into the fuel system indicator will affect accuracy of the fuel remaining. See the Installation Manual for further details.

T TO E DISPLAY MODE:

Time to Empty is calculated by dividing fuel remaining by fuel flow. The value is displayed in hours and minutes up to 19 hours and 59 minutes.

If the programmable low T to E limit is violated, a bar in the upper left corner of the display will appear when displaying time to empty. See the Pilot Programmable Settings section to set the time to empty limit.

AUX (AUXILIARY CHANNEL) DISPLAY MODE

The AUX channel is configured to monitor airplane fuel pressure in pounds per square inch.

If the programmable high AUX limit is violated a bar will appear in the upper left corner of the LCD display in the AUX mode and the H/L AUX warning LED will blink. If the programmable low AUX limit is violated a bar will appear in the lower left corner of the LCD display in the AUX mode and the H/L AUX warning LED will blink. If the high and low AUX limits are programmed to “00.0” the fuel system indicator will display OFF when the AUX mode is selected. See the Pilot Programmable Settings section of this manual to set the high and low AUX limits.

PILOT-PROGRAMMABLE SETTINGS

The fuel system indicator has a number of pilot programmable settings which are detailed in Figure 7-13. The following chart is an overview of the display modes and pilot programmable settings available:

	Display Mode (indicated by a green LED)				
	FLOW	**REM**	**USED**	**T. to E.**	**AUX**
Pilot Programmable Settings (push both PRG buttons)	Set fuel system indicator to display in US Gal, Imp Gal, Lbs or Ltrs	Add Fuel	Set the First Low Fuel Alarm	Set the Time to Empty Alarm	Set the High Aux Alarm
			Set the Second Low Fuel Alarm	Set the Re-occurring Fuel Used Alarm	Set the Low Aux Alarm

Figure 7-13, Pilot Programmable Settings

SETTING THE DISPLAY FOR U.S GAL, IMP GAL, LBS, OR LTR IN THE FLOW DISPLAY MODE

In the FLOW display mode the fuel system indicator may be set to display fuel flow, fuel remaining and fuel used in U.S gallons, Imperial gallons, pounds or litres. To programme the display perform the following steps:

A. Select the FLOW display mode.

B. Momentarily push both PRG buttons. Either “Gal”, “br Gal”, “Lbs” or “Ltr” will be shown in the display. The fuel system indicator is ready to programme to display in U.S gallons, Imperial gallons, pounds or litres.

C. Set the display using the following procedure:

a) To change the display to “Gal”, “br Gal”, “Lbs” or “Ltr” – Moving the mode select switch to the right while pushing the left programme button will alternate the display between “Gal”, “br Gal”, “Lbs” or “Ltr”.

b) To exit – To exit the pilot programming settings for the FLOW display mode, momentarily push both PRG buttons at the same time. The programmed values will be stored in memory and internal batteries or external power are not required to store this information for life.

SETTING ADD FUEL

This procedure was described previously in the Display Modes and Operating Features section.

SETTING THE TWO LOW FUEL ALARMS IN THE “USED DISPLAY MODE

In the USED display mode the following alarms may be set:

First Low Fuel Alarm – The first low fuel alarm may be programmed to blink the LOW FUEL warning LED when the fuel remaining reaches the pilot programmed set point. Pushing any button or switch on the fuel system indicator will turn off the blinking LED. This limit is intended as a reminder. It may be set to remind the pilot when a specified amount of fuel remaining in the tanks has been reached. In the REM display mode a bar in the upper left corner of the display will appear when the first low fuel alarm limit is violated. Programming this alarm to “000” disables the alarm.

Second Low Fuel Alarm – The second low fuel alarm may be programmed to blink the LOW FUEL warning LED when the fuel remaining reaches the programmed set point. Pushing any button or switch on the fuel system indicator stops the blinking but the LOW FUEL warning LED will stay on. Programming this alarm to “000” disables the alarm.

To programme the first and second low fuel alarm limits, perform the following steps:

A. Select the USED display mode.

B. Momentarily push both PRG buttons. A bar will appear in the upper left corner of the display and the left digit will blink. The fuel system indicator is ready to programme the first low fuel alarm limit.

C. Set the first and second low fuel alarm limits using the following procedure:

a) Select a digit – The right and left PRG buttons move the blinking digit to the right or to the left.

b) Changing the digits– Moving the STEP switch to the right will change the blinking digit.

c) Change functions – The display will toggle between the first and second low fuel alarm by pushing the STEP switch left with left digit blinking. The first low fuel alarm limit is always displayed with a bar in the upper left corner of the display and the second low fuel alarm limit is always displayed with a bar in the lower left corner of the display.

d) To exit – To exit the pilot programming settings for the USED display mode, momentarily push both PRG buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

SETTING THE TIME TO EMPTY ALARM AND THE REOCCURRING FUEL USED ALARM IN THE T TO E DISPLAY MODE

In the T to E display mode the following alarms may be set:

Time to Empty Alarm:

The time to empty alarm may be programmed to blink the LOW FUEL warning LED when the time to empty calculated by the fuel system indicator reaches the programmed set point. Pushing any button or switch on the fuel system indicator will turn off the blinking LED. This limit may be set to remind the pilot when a specified time to empty has been reached. In the T to E display mode a bar in the upper left corner of the display will appear when this limit has been violated. Programming this alarm to “0:00” disables the alarm.

Reoccurring Fuel Used Alarm:

The reoccurring fuel used alarm may be programmed to blink the LOW FUEL warning LED each time the fuel used reaches the programmed limit. Example: If the airplane has 200 litres/gallons on board and the pilot sets the reoccurring alarm to 50 litres/50 gallons. The alarm will activate every 50 litres/50 gallons of fuel used (i.e. when the fuel levels reach 150, 100, 50 litres/gallons). Pushing any button or switch on the fuel system indicator will turn off the blinking LED. This limit may be set to remind the pilot to check fuel levels at specified fuel levels. Programming this alarm to “000” disables the alarm.

To programme the time to empty and reoccurring alarms, perform the following steps:

A. Select the T to E display mode.

B. Momentarily push both PRG buttons. A bar will appear in the upper left corner of the display and the left digit will blink. The fuel system indicator is ready to programme the time to empty alarm limit.

C. Set the time to empty and reoccurring alarm limits using the following procedure:

   a) Select a digit – The right and left PRG buttons move the blinking digit to the right or to the left.

   b) Changing the digits – Moving the STEP switch to the right will change the blinking digits.

   c) Change functions – The display will toggle between the time or empty alarm limit and the reoccurring alarm limit by pushing the right PRG button with the right digit blinking or by pushing the left PRG button with the left digit blinking. The time to empty alarm limit is always displayed with a bar in the upper left corner of the display and the reoccurring alarm limit is always displayed with a bar in the lower left corner of the display.

d) To exit – To exit the pilot programming settings for the T to E display mode, momentarily push both PRG buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

SETTING THE HIGH AND LOW AUX (FUEL PRESSURE) ALARMS IN THE AUX DISPLAY MODE

In the AUX display mode the following alarms may be set:

High AUX Alarm – The high AUX alarm may be programmed to blink the H/L AUX warning LED when the fuel pressure value exceeds the programmed high set point. Pushing any button or switch on the fuel system indicator will stop the blinking but the H/L AUX warning LED will stay on. This limit is intended as a warning. It should be set to the highest acceptable level. In the AUX display mode a bar in the upper left corner of the display will be shown when the high limit has been violated. Programming this limit to “000” disables the alarm.

Low AUX Alarm – A low AUX alarm may be programmed to blink the H/L AUX warning LED when the fuel pressure value exceeds the programmed low set point. Pushing any button or switch on the fuel system indicator will stop the blinking but the H/L AUX Warning LED will stay on. This limit is intended as a warning. It should be set to the lowest acceptable level. In the AUX display mode a bar in the lower left corner of the display will be shown when the low limit has been violated. Programming this limit to “000” disables to alarm.

To programme the high and low AUX alarms, perform the following steps:

A. Select the AUX display mode.

B. Momentarily push both PRG buttons. A bar will appear in the upper left corner of the display and the left digit will blink. The fuel system indicator is ready to programme the high AUX alarm limit.

C. Set the high and low alarm limits using the following procedure:

a) Select a digit – The right and left PRG buttons move the blinking digit to the right or to the left.

b) Changing the digits– Moving the STEP switch to the right will change the blinking digit.

c) Change functions – The display will toggle between the high and low alarm limits by pushing the STEP switch left with the left digit blinking. The high alarm limit is always displayed with a bar in the upper left corner of the display and the low alarm limit is always displayed with a bar in the lower left corner of the display.

d) To exit – To exit the pilot programming settings for the AUX display mode, momentarily push both PRG buttons at the same time. The programmed values will be stored in memory and no internal batteries or external power are required to store this information for life.

OIL TEMPERATURE AND PRESSURE INDICATOR

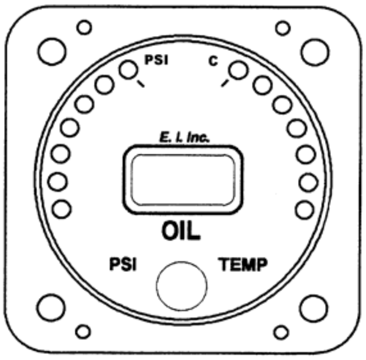


Figure 7-14, Oil Temperature and Pressure Indicator

The oil pressure indicating system comprises an indicator and pressure transmitter, flex hose, a union and associated wiring. The indicator is connected electrically to a transmitter located on the firewall in the engine bay which is connected by rigid piping and flex hoses to a restrictor/union in the casing of the engine oil pump filter assembly.

The oil temperature indicating system comprises a temperature indicator, a temperature probe (engine component) and associated wiring. The indicator is connected to a temperature sensitive probe in the engine accessory gearbox housing via thermocouple wires.

The Electronics International OPT-1, as shown in Figure 7-14 is a combined oil pressure and oil temperature indicator mounted in the centre of the instrument panel and it is a precision instrument featuring dual 90^0 analogue displays and a single digital display. The analogue displays provide a quick reference for oil pressure and temperature with respect to the operating range. The digital display provides a method of monitoring oil pressure to 1 psi or oil temperature to 1^{O}C. A toggle switch changes the digital display between oil pressure and oil temperature.

The OPT-1 does not incorporate any moving parts.

The analogue display incorporates green (normal operating range), yellow (caution range) and red (maximum limit) lights. At a glance the pilot can get a relative idea of where in the range the engine is operating and how close this is to the limits. A red light

will blink 20 times at full intensity when a limit is exceeded. After 20 blinks the red light will stop blinking and display continuous red. Lighting intensity is controlled using the airplane instrument lighting control, however, the red light intensity will always remain bright.

Oil pressure readings at or below 5 psi will be displayed as “00”.

CAUTION

The digital display should be used for precise oil temperature and pressure indications.

OIL PRESSURE WARNING LIGHT

A red coloured warning light marked OIL PRESS LOW is incorporated in the annunciator panel and connected between the 28 V bus and a pressure sensitive switch. The switch is 'teed' in the oil pressure line in the engine bay. A drop in engine oil pressure below 5 psi will allow the switch to close providing an earth for the warning light which will illuminate.

IGNITION SYSTEM

GENERAL DESCRIPTION

The ignition system comprises an ignition exciter box, two high tension leads, two spark igniters, an ignition monitor light in the annunciator panel, an ignition switch and a starter switch. Electrical energy from the exciter box, mounted on the left engine mount truss, is transmitted via two high tension leads to two igniters, at the four and nine o'clock positions on the gas generator case adjacent to the fuel manifold. The ignition system is normally energized only during engine start.

Ignition is controlled by one switch, located on the switch and circuit breaker panel, labelled IGNI. The ignition switch has three positions, AUTO, CONT/CONTINUOUS, and OFF. The AUTO position arms ignition so that ignition will be obtained when the starter switch is activated. This position is used during all ground starts and during air starts with starter assist. The CONT/CONTINUOUS position is for ignition whilst in flight. A blue coloured warning light marked IGN ON will illuminate when CONT/CONTINUOUS is selected.

IGNITION EXCITER

The ignition exciter is a sealed unit containing electronic components encased in an epoxy resin. The unit is energized during the engine starting sequence to initiate combustion in the combustion chamber and as desired during flight. The exciter transforms 28 V DC input to a high voltage output through solid state circuitry, a transformer, and diodes.

IGNITION CABLES

The two individual ignition cable assemblies carry electrical energy output from ignition exciter to engine mounted spark igniters. Each lead assembly comprises an electrical lead contained in a flexible metal braiding. Coupling nuts at each end of the assembly facilitate connection to connectors on the ignition exciter and spare igniters. Mounting flanges for attachment to engine fireseals are brazed on to flexible braiding.

SPARK IGNITERS

The spark igniters are located at the four and nine o'clock positions on the gas generator case adjacent to the fuel manifold. They are constructed of a double-ended, threaded plug with a central positive electrode enclosed in an annular semi-conducting material. The electrical potential developed by the ignition exciter is applied across the gap between the central conductor and igniter shell (ground). As this potential increases a small current passes across the semi-conducting material. This current increases until the air gap between the central conductor and shell ionizes. When ionization occurs, high energy discharges between the electrodes. The spark always occurs in the annular space between the central conductor and shell.

WARNING

Residual voltage in the ignition exciter may be dangerously high. Ensure ignition is switched off, and that the system has been inoperative for at least six minutes before removing or handling any ignition components. Always disconnect coupling nuts at the ignition exciter end first. Always use insulated tools to remove cable coupling nuts. Do not touch output connectors or coupling nuts with bare hands.

EXHAUST SYSTEM

The exhaust system provides the means of ducting the jet efflux to atmosphere clear of the engine compartment.

The exhaust assembly comprises two stub pipes welded to two flanges and the assemblies are secured to the engine exhaust flanges by corrosion resistant nuts and bolts.

STARTING SYSTEM

The engine starting system comprises a starter generator, a start switch, a start circuit breaker, a starter relay, a warning light and associated wiring.

When starting the engine, the ignition and engine starting circuits are energised simultaneously by the START switch.

NOTE

To motor the engine, the ignition circuit should be isolated by placing the IGN/IGNITION Switch OFF (unless otherwise stated).

With the BATTERY MASTER switch ON and the IGN/IGNITION switch AUTO, selecting the START switch to START and holding for approximately 1 second and releasing will activate the start cycle. The GCU via a relay will hold in the start relay until 50% Ng is attained. This is controlled by a speed sensor built into the starter/generator.

Should the start cycle need to be stopped, select the START switch to INTER. This will break the circuit from the GCU to the start relay. During all starts a starter energized amber coloured light marked STARTER ENERGISED will illuminate in the annunciator panel when the starter is energised.

CHIP DETECTOR

An amber coloured warning light marked CHIP DETECTOR is mounted in the annunciator panel and connected between the 28 V bus and magnetic chip detector located in the lower forward case of the engine reduction gearbox housing.

Ferrous metal particles in the oil coming in contact with the detector will complete an earth for the warning light which will illuminate.

7.14 PROPELLER

DESCRIPTION

The airplane is equipped with a three blade, Hartzell, constant speed, feathering and reversible pitch propeller, model HC-B3TN-3D/T10282NS+4. The propeller uses a single oil supply from a governing device to hydraulically actuate a change in blade angle.

Propeller blades and bearing assemblies are mounted on the arms of a steel hub unit and are held in place by two-piece blade clamps. A cylinder is threaded on to the hub, and a feathering spring assembly is installed in the cylinder. A piston is placed over the cylinder and is connected by a link arm to each blade clamp. Propeller blade angle change is accomplished through the linear motion of the hydraulically actuated piston that is transmitted to each blade through the link arms and blade clamps. Refer to Figure 7-15 for a cross section schematic of the propeller.

The propeller blade angles are : -

Fine	:	18.5^0
Feather	:	86.3^0
Reverse Pitch	:	-8.1^0

While the propeller is operating, the following forces are constantly present: spring force, counterweight force, centrifugal twisting moment of each blade, and blade aerodynamic twisting forces. The spring and counterweight forces attempt to rotate the blades to a higher blade angle, while the centrifugal twisting moment of each blade is generally acting towards a lower blade angle. Blade aerodynamic twisting force is usually very small in relation to the other forces and will attempt to increase or decrease blade angle.

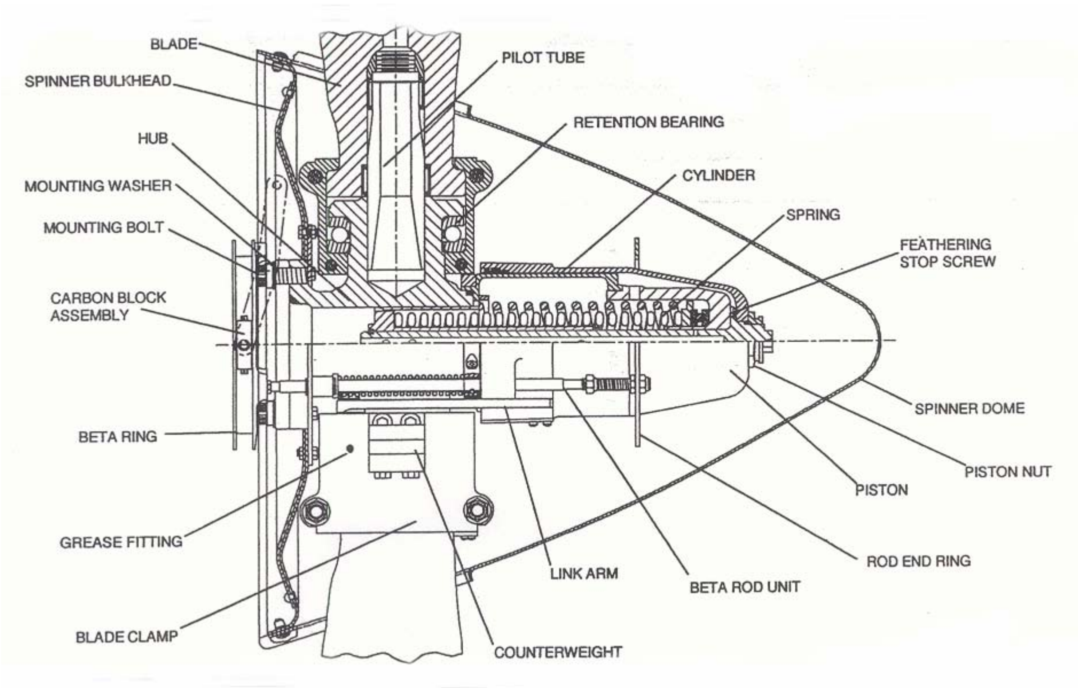


Figure 7-15, Propeller Schematic

The summation of the propeller forces is toward higher pitch (low rpm) and is opposed by a variable force toward lower pitch (high rpm). The variable force is oil under pressure from a governor with an internal pump, which is mounted and driven by the engine. The oil from the governor is supplied to the propeller and hydraulic piston through a hollow engine shaft. Increasing the volume of oil within the piston and cylinder will decrease the blade angle and increase propeller rpm. Decreasing the volume of oil will increase blade angle and decrease propeller rpm. By changing the blade angle, the governor can vary the load on the engine and maintain constant engine rpm (within limits), independent of where the power lever is set. The governor uses engine speed sensing mechanisms that allows it to supply or drain oil as necessary to maintain constant engine speed.

If governor supplied oil is lost during operation, the propeller will increase pitch and feather. Feathering occurs because the summation of internal propeller forces causes the oil to drain out of the propeller until the feather stop position is reached.

Normal in flight feathering is accomplished when the pilot retards the propeller lever past the feather detent. This allows oil to drain from the propeller and return to the engine sump. Engine shutdown is normally accomplished with the propeller feathered.

Normal in flight unfeathering is accomplished when the pilot positions the propeller lever into the normal flight (governing) range and restarts the engine. As engine speed increases, the governor supplies oil to the propeller, and the blade angle decreases.

In the reverse mode of operation, the governor operates in an underspeed condition to act strictly as a source of pressurised oil, without attempting to control rpm. Control of the propeller blade angle in reverse is accomplished through the beta valve.

The propeller is reversed by manually repositioning the power lever to cause the beta valve to supply oil from the governor pump to the propeller. An external propeller feedback mechanism, which includes a beta ring and carbon block assembly, communicates propeller blade angle position to the beta valve.

When the propeller reaches the desired reverse position, movement of the beta ring and carbon block assembly, initiated by the propeller piston, causes the beta valve to shut off the flow of oil to the propeller. Any additional unwanted movement of the propeller toward reverse, or any movement of the manually positioned beta valve control toward high pitch position will cause the beta valve to drain oil from the propeller to increase pitch.

PROPELLER CONTROL

The propeller is controlled by the pilot via the propeller lever in the forward high pitch mode and by the power lever in the low pitch reverse mode.

The propeller lever is connected to the propeller speed control lever on the top of the propeller governor by a push pull cable and tension cable. Rearward movement of the propeller lever is opposed by two springs, one is part of the governor, the other is a long coil tension spring. The effect of these springs is to return the propeller speed control lever to the maximum speed position.

The power lever is connected to the reversing cam. In forward mode the power lever has no effect on the propeller selected rpm. In the reverse or beta mode the power lever is pulled rearward past the 'gate', this action effects the beta valve which directs oil pressure into the propeller cylinder rotating the propeller to low pitch.

GOVERNING MODE

DESCRIPTION

The governing mode corresponds to a range of operations where engine power is sufficient to maintain the selected propeller speed by varying the blade angle (pitch). The propeller speed (governing range) is selected by the pilot and is between 75% and 91.2% Np. The system is governing when (on speed) the following occurs:

- Indicated propeller speed matches selected propeller speed.
- Change in Ng speed causes no change in propeller speed (changes in torque only).
- Moving the propeller lever results in a change in propeller speed.

MAIN COMPONENT FUNCTIONS

Pressure Relief Valve: Returns oil to the governor pump inlet when maximum pressure is reached.

Pump Gears: Supply a flow of oil at a pressure necessary to control the propeller pitch.

Flyweights: Sense the speed of the propeller and act against variable spring pressure to move the pilot valve up or down.

Pilot Valve: Moves up or down to control the oil pressure going to the propeller dome.

Speeder Spring: Opposes a mechanical force against the centrifugal force of the flyweights and determines propeller speed at which the flyweights will be ‘on speed’. The pilot controls spring tension through the propeller lever.

OPERATION

Oil from the engine main oil pump is supplied to the governor. A set of gear pumps, mounted at the base of the governor, increases the flow of oil going to the propeller governor relief valve.

When the oil pressure reaches the desired level, the relief valve opens to maintain the pressure. Through internal passages, the oil is routed to the pilot valve and then to the propeller transfer sleeve.

The flyweights and the pump gears are driven by a bevel gear arrangement mounted on the propeller shaft. Once the speed selected by the pilot is reached, the flyweight’s centrifugal force equals the spring tension of the speeder spring. The governor flyweights are then on speed.

When more power is applied to the engine, the flyweights turn faster and go into an overspeed condition, causing the pilot valve to move up and restrict oil flow to the propeller dome. The feathering spring increases the propeller pitch to maintain the selected speed. Reducing power causes an underspeed of the flyweights, downward movement of the pilot valve, more oil in the propeller dome, resulting in a finer pitch to control propeller speed.

BETA MODE – POSITIVE BLADE ANGLE

DESCRIPTION

Beta Valve: Prevents the blade angle from going below the specified Primary Blade Angle (PBA) in flight and allows the pilot to manually control the blade angle on the ground for taxiing and reverse operation.

Beta Mode: Corresponds to a range of operation where the blade angle is between PBA and reverse. Control of the propeller pitch is a direct function of the position of the beta valve.

Primary Blade Angle (PBA): Minimum blade angle allowed for flight operation for the airplane.

The system is in the beta mode when: (Underspeed)

- Propeller speed indicated is below propeller speed selected.
- Ng speed change causes propeller speed change.
- Propeller lever movement does not change propeller speed.

The beta valve is operated by two means:

- **Beta Feedback System**: In low pitch operation, the beta nuts, beta rods, slip ring, carbon block and the beta lever, which comprise the beta feedback system, actuate the beta valve.

- **Power Lever**: Movement of the power lever in the beta range causes the reversing cam to actuate the beta valve, thus causing the blade angle to change.

OPERATION

At low power operation, with the propeller lever at max rpm, the propeller does not turn fast enough to satisfy the demand. In this condition, the pilot valve moves down and high pressure oil goes to the propeller dome, moving the blades towards a fine pitch.

When the preset PBA is reached, the servo piston, in its forward movement contacts the beta nuts. Any further forward motion of the slip ring is transmitted to the beta valve via the beta lever. Forward movement of the beta valve causes servo pressure to drop, which prevents any further blade angle change. At this point, blade angle control is no longer a function of the propeller governor. The beta system is now in control.

In flight, the beta valve maintains a constant oil volume in the propeller dome to ensure blade angle remains at PBA.

On the ground, the pilot is able, with the power lever, to actuate the beta valve and change the blade angle as desired for taxiing and reverse operation.

BETA MODE – NEGATIVE BLADE ANGLE

DESCRIPTION

The reverse beta mode allows the pilot to control the propeller blade angle in reverse. Reverse operation is obtained by moving the power lever below the idle detent, into the reverse range. The reversing cam pulls on the reversing cable to move the beta valve inwards, allowing more oil to flow into the propeller dome and send the propeller blades into reverse pitch.

OPERATION

Moving the power lever rearwards causes the reversing cam and cable to move the beta valve rearward, allowing more oil to flow into the propeller dome, causing the blades to go to reverse pitch. The reset arm on the Nf governor is also moved rearward by the reversing cable while the blade angle is moving towards reverse. This causes the reset lever and reset post to move down. As Np increases in reverse operation, the governor flyweights begin to move outwards. Before the flyweights reach the on-speed position, the speeder spring cup pushes the reset lever, which pivots and allows Py to bleed into the propeller governor. This will limit Ng to control Np to a preset level.

PROPELLER RPM INDICATING SYSTEM AND INDICATOR

DESCRIPTION

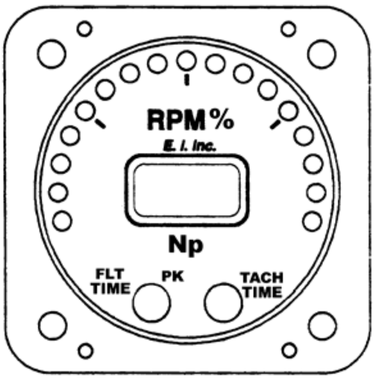


Figure 7-16, Propeller Speed Indicator

The propeller indicating systems (Np) comprises an indicator, a circuit breaker, a tachometer generator and associated wiring. The propeller tachometer generator is mounted in the 2 o'clock position on the front casing of the engine adjacent to the propeller. The propeller tachometer generator provides an electric current to the propeller rpm indicating system indicator.

The Electronics International R-1 propeller speed indicator, as shown in Figure 7-16 is graduated as a percentage of the power turbine speed or expressed as an rpm and it is located in the centre of the instrument panel.

The indicator features a 210^0 analogue display and a digital display. There are no moving parts (needles, bearings and springs etc) in the indicator. The internal microprocessor provides accuracy and repeatability.

ANALOGUE DISPLAY

The 210^0 analogue display provides a quick reference of the Np with respect to the operating range. The red (maximum limit) and green (normal operating range) lights provide a visual indication of the current operating range. The red light will blink 20 times at full intensity when the maximum limit is exceeded. After 20 blinks the red light will stop blinking and display a continuous red light. The digital display will continue to provide rpm readings beyond the maximum limit. The analogue lights may be dimmed using the airplane instrument lighting controls, however, the red light will always be displayed at full intensity.

DIGITAL DISPLAY

The digital display provides Np information as a percentage in tens, units and one decimal place or as a rpm.

CAUTION

The digital display should be used for precise Np indications.

TACH TIMER

The tach timer keeps a running total of time the engine is above 45% Np or 990 rpm. The time is stored in the indicator's memory for life. To display the time on the tach timer in thousands of hours, press the right push button marked TACH TIME and hold the button in. The digital display will show two digits which represent thousands of hours on the tach timer. To display the hundreds, tens, units and 1/10 hours on the tach timer release the TACH TIME button for no more than two seconds and press it again and hold it in. The display will show four digits with a decimal. The digits represent hundreds, tens, units and 1/10 hours on the tach timer. Each time the TACH TIME button is pushed and held in the display will toggle between the two displays. If the TACH TIME button is released for more than three seconds the display will revert back to Np.

FLIGHT TIMER AND PEAK RPM

The indicator includes an automatic timer. When Np meets or exceeds 65% or 1430 rpm for 10 seconds, the flight timer will reset to "00.00" and start timing in one minute increments. The peak Np register will also reset to "0000". The flight timer will continue to count until the Np drops below 65% Np or 1430 for 10 seconds. At this point the flight time and peak Np will be stored in the memory. There are no internal batteries in the indicator and bus power is not required to keep the memory alive. The last flight time and peak Np will always be available even if the power is turned off.

As the flight timer is counting, the maximum Np is also being recorded. For a Np to be recorded as peak it must exceed the last recorded Np for three seconds or longer.

To display flight time press the button marked FLT TIME and hold it in. The digital display will display the flight time in hours and minutes.

To display the highest Np reached during the flight release the FLT TIME button for no more than two seconds and press it again and hold it in. The digital display will show the peak Np reached during the flight. Each time the FLT TIME button is pushed in the display will toggle between flight time and peak Np. If the FLT TIME button is released for more than three seconds the display will revert back to Np.

BETA WARNING LIGHT SYSTEM

A blue coloured warning light marked BETA located in the annunciator panel will illuminate to alert the pilot that the propeller is entering the beta range i.e. the blade angle has passed the normal low pitch setting and is moving toward the reverse pitch range. The light is energised by a micro switch which is actuated by the beta lever in the beta feedback system.

OVERSPEED GOVERNOR RESET

A press to operate button located in the switch panel marked OSPEED/O/SPEED GOV is used to check the functioning of the propeller overspeed governor. When pushed in, an electric solenoid valve is actuated which ducts oil pressure to the top of the speeder spring assembly. The oil pressure acting on the top of the speeder spring reduces the RPM at which overspeed will occur thus permitting testing.

7.15 FUEL SYSTEM

GENERAL DESCRIPTION

The airframe fuel system is designed to deliver fuel under constant pressure to the engine once the fuel shut off valve (fuel cock) and electrical fuel pump switch are placed in the ON position. The system may be considered as two discrete systems integrated at the front sump tank. The design of the system is such that the front wing tanks are the primary tanks and the rear wing tanks the secondary.

WARNING

The airplane must be operated in compliance with the fuel limitations detailed in Section 2 Limitations.

WARNING

The airplane must not be flown with fuel in the rear tanks unless the front tanks are full.

The system as shown in Figure 7-17 includes the following components:

Left and right hand front and rear wing storage tanks

Front sump tank incorporated in left front wing storage tank,

One fuel filter

Fuel shut off valve

Electric fuel pump

"Jet Pumps"

Fuel pressure warning and filter restriction warning system

Fuel quantity indicating system

Associated delivery/vent piping

SYSTEM OPERATION

The fuel system schematic is shown in Figure 7-17. The system consists of a rear tank each side, connected by a balance line, and a front tank each side located in the leading edge of the wing, again connected by a balance line. The inboard 13" of the port front tank is partitioned off and is used as a collector tank. A submersible emergency/auxiliary pump (P_2) is fitted in this collector tank.

The engine driven fuel pump P1, is the primary pump supplying fuel to the engine Fuel Control Unit (FCU) under pressure. It also supplies pressurized fuel to the 4 jet-pumps. Fuel is continuously circulating to the four jet pumps, picking up fuel from the rear tanks and depositing it into the front tanks and the collector tank.

The system is designed in such a way that the rear tanks will empty first while the front tanks remain full. After the rear tanks run dry, fuel will be drawn from the front tanks. The collector tank will stay full at all times until the front tanks run dry. At cruise power settings the engines fuel consumption is less than the combined fuel transfer rate and the collector tank overflows back into the left front tank which also overflows into the left rear tank. This system automatically ensures that the collector tank is always full.

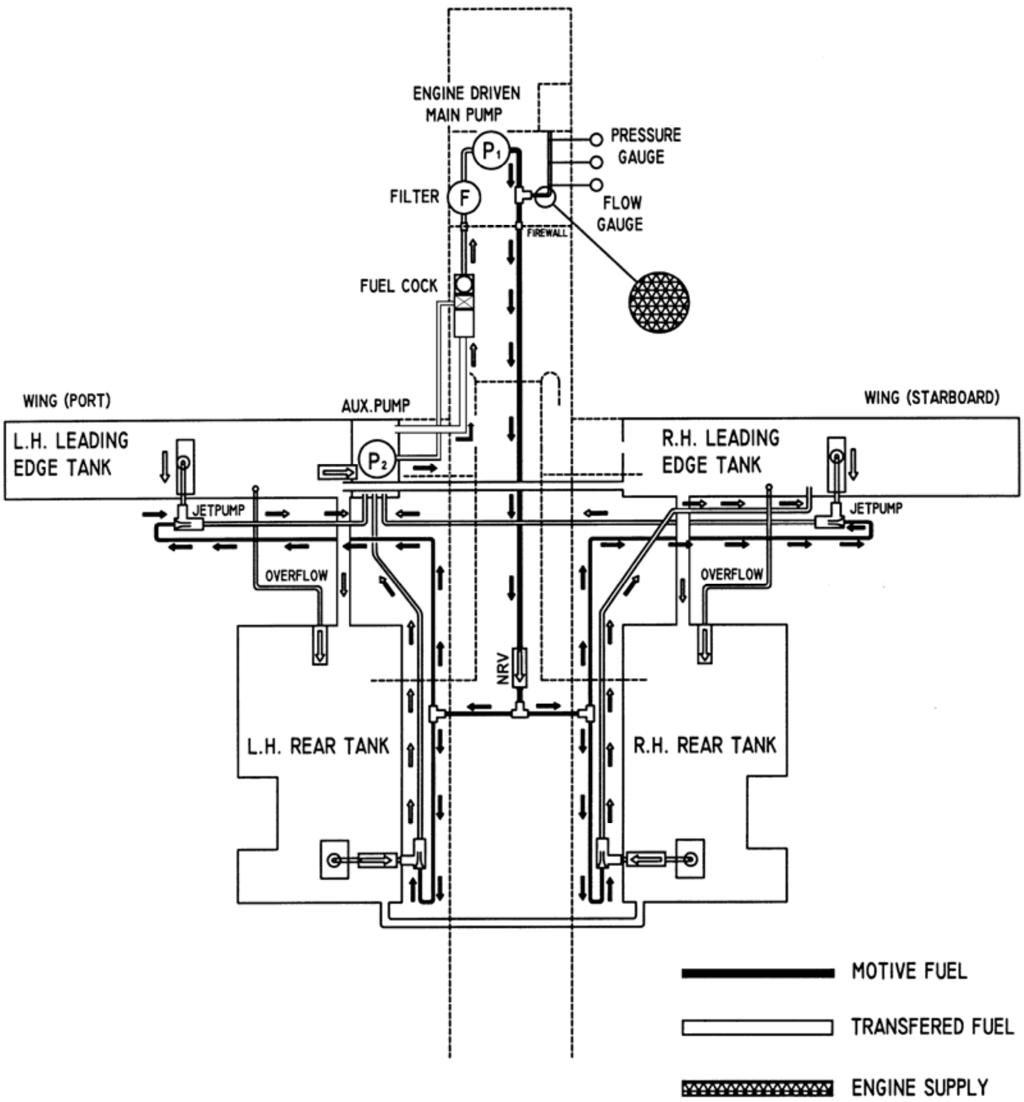


Figure 7-17, Fuel System

NOTE

Due to the overflow capability from front to rear tanks and the position of the front tank filler cap openings, the front tanks may not be able to be filled to 100% full while the aircraft is being refuelled on the ground. However, if sufficient fuel is in the rear tanks, upon engine start the rear fuel transferred to the front tanks will bring the front tank levels up to 100% full. In this circumstance, if the front tank filler caps are not correctly replaced in their openings fuel will leak from the front filler caps. Similarly, if a ferry fuel system is fitted to the aircraft and the rear tanks are overfilled in flight, fuel will be forced from the front tank filler caps. For ferry fuel system operating particulars refer to the applicable AFM ferry fuel supplement.

WARNING

Loose front tank filler caps will result in ongoing fuel loss

A float switch in the collector tank coupled to an indicator light in the cockpit informs the pilot of the fuel level in the collector tank. If the light comes on, it either means that the aircraft is running out of fuel or that a failure (blockage) of at least one of the front jet pump has occurred. Inspection of the fuel content gauges of the various tanks will reveal which scenario is likely.

The NRV between port front tank and collector tank will only open if one of the front jet pumps has failed allowing gravity feed to the collector tank.

The NRV in the fuel supply line to the jet pumps is installed to ensure that even after a double failure (both P_1 and P_2 pumps rendered ineffective) fuel can be accessed from the front tanks by suction from the FCU pump. The NRV will ensure that no air can be drawn in from empty rear tanks.

Operation of the fuel system is monitored by an amber warning light marked FUEL PRES LOW in the annunciator lights panel which will illuminate should the system pressure falls to 6 psi. An amber warning light marked FUEL FILTER BYPASS in the Annunciator panel will illuminate should the pressure differential across the inlet and outlet ports of the fuel filter rise above 2.5 psi $\pm$ 0.20 psi.

The system is vented by two pipes which connect the front and rear tanks respectively before venting overboard through the fuselage lower surface under the cabin. The vents must be checked prior to flight to ensure that they are not blocked or obstructed. The fuel system will continue to operate with one vent blocked but with both blocked the engine will be starved of fuel.

WARNING

The fuel vents must be checked prior to flight to ensure they are clear of any obstructions or blockages.

TANKS

The wing fuel storage tanks comprise front and rear cells fabricated in the centre wing structure on the left and right hand sides of the fuselage. The contents of each wing tank is measured by a capacitance sensor and indicated on dual indicators in the instrument panel.
The fuel tank capacities are as follows:

TANK	TOTAL CAPACITY	UNUSABLE FUEL	USABLE
FRONT LEFT TANK *	**284* litres, 499 lbs 75* U.S. gallons**	**10 litres, 18 lbs 3 U.S. gallons**	**274 litres, 481 lbs 72 U.S. gallons**
FRONT RIGHT TANK	**293 litres, 515 lbs 77 U.S. gallons**	**10 litres, 18 lbs 3 U.S. gallons**	**283 litres, 497 lbs 74 U.S. gallons**
REAR LEFT TANK	**142 litres, 249 lbs 37.5 U.S. gallons**	**0**	**142 litres, 249 lbs 37.5 U.S. gallons**
REAR RIGHT TANK	**142 litres, 249 lbs 37.5 U.S. gallons**	**0**	**142 litres, 249 lbs 37.5 U.S. gallons**
TOTAL	**861 litres, 1512 lbs 227 U.S. gallons**	**20 litres, 36 lbs 6 U.S. gallons**	**841 litres, 1476 lbs 221 U.S. gallons**

*Includes 26 litres (6.8 U.S. gallons) of fuel in collector tank

Figure 7-18, Fuel Tank Capacities

Each front tank is equipped on the upper surface with a filler aperture and cap and a quantity sensor. The lower surface incorporates access panels and drain points.

Each rear tank is equipped on the upper surface with three access panels one of which incorporates the filler aperture and cap, in the lower surface are two drain points. A quantity sensor is mounted diagonally across the tank.

The sump tank is part of the left forward tank with a capacity of 26 litres (6.8 U.S. gallons). Mounted in the sump is the electric auxiliary fuel pump.

AUXILIARY FUEL PUMP

One immersed pump/motor unit is employed to provide the engine fuel system with a constant supply of pressure fuel. The pump is fitted in the sump tank. The pump is of a centrifugal type and offers no resistance to the flow of fuel when not operating. The pump is powered through a 10 amp circuit breaker. The pump is connected to a blue indicator light, AUX FUEL PUMP ON which will remain illuminated whilst the pump is operating.
Under normal operations the pump operates during engine start and during emergency operation. The pump is controlled by a switch in the switch panel marked FUEL. The switch has three positions, AUTO, OFF AND MAN/MANUAL. During start and for normal operations the switch should be selected to AUTO. During start the pump will supply fuel to enable engine start. The pump will automatically switch off (If AUTO selected) when the engine driven fuel pump is able to supply sufficient fuel pressure to meet engine demands. If the engine driven fuel pump fails and the FUEL switch is selected to AUTO the auxiliary fuel pump will automatically come on line and provide sufficient fuel for normal operations. The blue annunciator light marked AUX FUEL PUMP ON will illuminate to indicate the pump is switched on. Refer Section 3 Emergencies Procedures for actions in the event of an engine driven fuel pump failure.

FUEL FILTER ASSEMBLY

A single fuel filter is mounted on brackets on the left side of the front face of the firewall. Access to the Curtis drain valve in the base of the filter is provided by a hole in the lower engine cowl. Access for filter maintenance is provided by removal of the engine cowlings.

FUEL PRESSURE WARNING

In addition to the cockpit fuel pressure indicator (displayed in the AUX mode on the fuel system indicator), a warning system is provided to alert the pilot of a failure in system delivery pressure. The amber light is located in the annunciator panel. The low fuel pressure warning light is marked FUEL PRES LOW. The low fuel pressure switch is located downstream from the filter in the engine compartment. The warning light will illuminate when the system pressure falls to 6 psi.

FILTER IMPENDING BYPASS WARNING

A warning system is provided to alert the pilot of an impending filter bypass due to filter contamination. An amber light is located in the annunciator panel. The filter bypass warning light is marked FUEL FILTER BYPASS. The filter impending bypass switch is screwed into the filter head. The red warning light in the annunciator panel will illuminate if system pressure drops by a differential of 2.5 psi $\pm$ 0.2 psi.

LOW FUEL LEVEL WARNING

An amber coloured low fuel level warning light marked LOW FUEL LEVEL located in the annunciator panel illuminates when the fuel remaining level in the airplane fuel tanks is 24 litres (6.3 U.S gallons) or less. Refer to section 3 Emergencies Procedures for actions in the event of the LOW FUEL LEVEL light illuminating.

FUEL SHUT OFF VALVE (FUEL COCK)

The fuel shut off valve is located under the floor of the cockpit on the left side of the fuselage between the sump tank and the fuel filter. It is operated from a simple ON/OFF push/pull lever mounted on the control centre console. The fuel shut off valve is open (allowing fuel to flow to the engine) when the lever is fully pushed in and the fuel shut off valve is closed (stopping flow of fuel to the engine) when the lever is pulled fully out. There is a safety lock fitted to prevent inadvertent movement of the lever when in the ON position.

NON-RETURN VALVES (CHECK VALVES)

Six hinged flap type non-return valves in the system prevent fuel feedback to the wing tanks.

FUEL QUANTITY INDICATING SYSTEM

DESCRIPTION

The fuel indicating system comprises individual tank transmitters, associated indicators and wiring. Each transmitter and indicator is calibrated as a set before installation in the airplane. Electronics International capacitive fuel level probes are installed in each fuel tank. Each probe (sensor) is laid diagonally from the top to bottom of the fuel tank. Access to the probes is via a cover plate on the upper surface and access panels in the lower surface of the front tanks or lower panels of the rear tanks.

FUEL INDICATORS

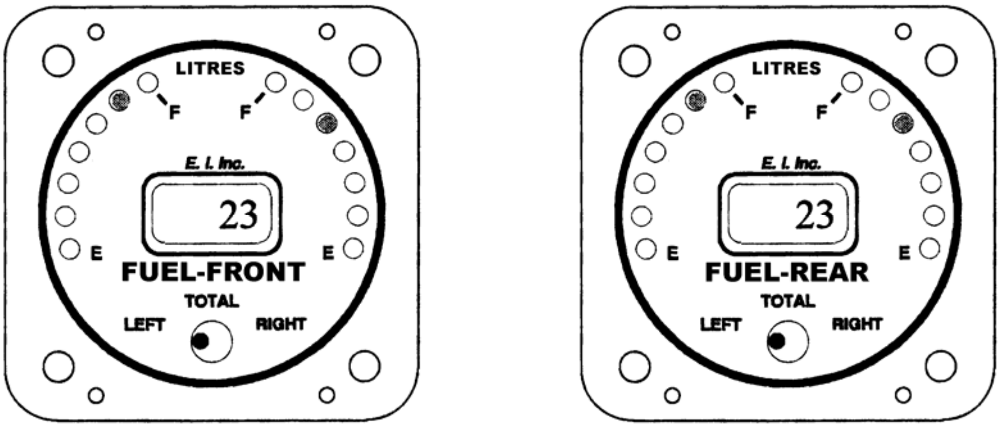


Figure 7-19, Fuel Quantity Indicators

Two Electronics International FL-2CA fuel indicators as shown in Figure 7-19 are fitted to the airplane. One indicator is for the front tanks and the other for the rear tanks. The indicators are a fuel level instrument featuring dual 90^0 analogue displays and a digital display operating off a capacitance system. The two displays provide the primary indication of the fuel level for the front left and right wing tanks and the rear left and right wing tank. The indicators can be calibrated to display in litres, pounds or gallons. The indicators do not incorporate any moving parts (needles, bearings, springs, etc). The indicators have a programmed filter that affects how quickly the indicator responds to changes in fuel level. Refer to the Installation Manual for further details.

ANALOGUE DISPLAY

The dual 90^0 analogue displays provide a quick reference of the front and rear left and right fuel levels. An advantage of the analogue display is its ability to emit a green (normal operating range), yellow (caution range) or red (minimum limit) light. With a quick glance the pilot can determine if the fuel level is in the green, yellow or red operating range. In addition the indicators provide the following warnings:

1. ¼ Tank Warning – If the left or right tank level reaches ¼ of a tank, the appropriate yellow LED will blink. This is intended to alert the pilot that the fuel level is getting low.

2. Low Fuel – If the left or right front tank reaches 1/8th of a tank the appropriate red LED will blink. If the left or right rear tank reaches 1/8th of a tank the appropriate yellow LED will blink. These blinking lights are intended to alert the pilot that the fuel level is getting very low.

3. "OPEN" – If the wire to the left or right tank sensor becomes open, the analogue display for the tank with the problem will show empty and the digital display will show OPEN. This warning is intended to alert the pilot when the indicators have lost the signal from one or both of the fuel sensors.

To acknowledge a blinking LED (i.e. stop the blinking) change the position of the tank selector switch. Once a blinking warning is acknowledged it will not occur again until the indicators' power has been turned off and back on.

Lighting to the analogue LEDs is controlled using the airplane instrument lighting control. The red LED's will always be displayed at full intensity.

DIGITAL DISPLAY

With the tank selector switch in the left or right position the digital display will show the fuel level in the appropriate tank. With the tank selector switch in the centre position the total fuel (left + right) will be displayed.

On power-up the indicators perform the following tests in sequence.

1. The left tank's calibration data is checked for errors. A table of error codes is provided in the Operating and Installation Instructions Manual for the indicators. If an error is found, the appropriate error code is displayed and the indicator operation is stopped.

2. The right tank's calibration data is checked for errors. If an error is found the appropriate error code is displayed and the indicator's operation is stopped.

3. A self test is performed, all the LED's are sequenced and "8888" is shown on the display.

WARNING

Do not solely rely on the fuel indicating system to determine the fuel levels in the airplane.

WARNING

The accuracy of the fuel indicating system will be affected if the airplane is parked on sloping ground.

WARNING

The use of the fuel indicating system does not eliminate or reduce the necessity for the pilot to use good flight planning, pre-flight and in-flight techniques for managing fuel.

WARNING

The fuel indicating system is calibrated with the airplane in a cruise angle of attack. If the airplane is in a condition other than cruise, the indicators may display inaccurate fuel levels.

WARNING

As a tank is filled the fuel sensor may not be able to detect the fuel entering the upper corners of the fuel tank. If this is the case, the indicator will display lower fuel levels than the actual fuel in the tanks when the tanks are full. When the fuel level drops to a point where the fuel sensors start to detect a change, the displayed fuel level should be accurate. Check the system by comparing the displayed fuel levels on indicator the fuel levels listed in the flight manual at each fill up.

WARNING

Do not rely on the fuel indicator to determine the fuel in the tank for indicated tank levels below 1/8th.

WARNING

It is important the pilot verifies the accuracy of the fuel indicators. Always cross-check the measured fuel levels in the tanks with the readings on the fuel indicators before each flight.

WARNING

If the pilot ever finds an inaccuracy issue or any other problem with fuel indicator cover the face of the instrument with a note saying DEFECTIVE.

FUEL DRAINS AND VENTS

The following fuel drains are fitted to the airplane:

> Front left tank, sump tank (located left wing inboard), rear left tank, right front tank, right rear tank and fuel filter (bottom left of firewall). The fuel drains allow a fuel sample to be taken and checked to ensure the fuel is free from water and any contamination. Refer to Section 8 for procedures on checking for fuel contamination.

There are two fuel tank vents located on the inboard section on the left and right wing.

7.16 HYDRAULIC SYSTEM

The airplane main wheel brakes are hydraulically operated. The brake system is described in Section 7.8. Refer to Section 8 for hydraulic fluid replenishment procedures.

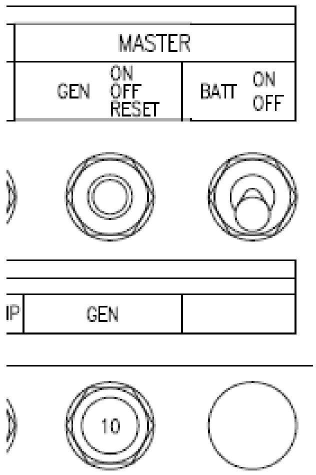
7.17 ELECTRICAL SYSTEM

GENERAL DESCRIPTION

The electrical system is a 28 V DC single wire negative earth return system.

Power is provided from two internal sources. The generator system, as a main source under normal conditions, and the battery system which is employed for engine starting and system operation when generator power is not available (engine not running or generator is off line). Both systems feed Bus Bars 1 & 2.

Control of the electrical power from the two systems is by a BATTERY MASTER switch marked BATT and a GENERATOR MASTER switch marked GEN. Both of these switches are located adjacent to each other at the right hand end of the left switch/CB panel. The GEN & BATT switches form the pilot's Master Switch control. With the engine running and the BATT switch OFF and the GEN switch ON, electrical power is still being supplied to any electrical device selected ON. Monitoring of the electrical system is made by reference to the combination Volts/Ammeter located in the lower portion of the right hand section of the instrument panel.



Generator & Battery Master switches.

All circuits are protected by circuit breakers or fuses. Wiring is installed in open looms supported by clips and frame holes and protected with a sleeve where necessary. Wiring routed to the forward part of the engine compartment passes through stainless steel ducts to protect it from heat. Disconnect points are provided for the removal of all major components.

BATTERY SYSTEM

The battery system comprises a 24 V 28 ampere-hour battery, dual Bus 1 & Bus 2 master relays and associated wiring.

The system supplies power for engine start and operation of the electrical system when the generator is not running or has failed. The battery is isolated from the bus bars by the master relays (de-energised) when the BATT switch is OFF.

BATTERY

The airplane is equipped with a sealed gel acid battery. The battery is located in either the rear fuselage or on the engine compartment firewall.

Gases generated by charging are vented through the battery box venting system through a vent on the underside of the airplane immediately under the battery.

An ammeter and shunt system which is wired in series from the battery to the bus bars, will show a discharge when the battery is supplying the electrical system with the generator off line. With the generator on line, the current flow will be to the battery showing a charge rate on the ammeter dependent on the service load and the demand of the battery.

The battery is earthed to the airframe.

MASTER RELAYS

The dual master relays or battery contactors are solenoid operated bridge type contactors located in the relay box adjacent to the battery. The relays are controlled by the BATT switch and when energised by placing the BATT switch in the ON position, will connect the battery to the bus bars.

GENERATOR SYSTEM

The generator system comprises a starter/generator, a Generator Control Unit (GCU), a relay, a GENERATOR MASTER switch marked GEN, two circuit breakers labelled GCU and GEN, Generator Off warning light, associated wiring and terminal blocks.

The generator system is the main source of power for the electrical system. On engine start up when the START switch is pressed, the starter relay is energised and at the same time through the GCU the generator shunt field is opened, when the start relay is released the GCU reverts to the generator mode. At an engine power setting of 50 - 55% Ng the generator may be brought on line by placing the GEN switch to ON. The GCU provides output voltage control, system over voltage protection and reverse current protection for the generator.

The RESET position (spring loaded back to OFF) is used to attempt to bring the generator on line in the event of the generator going off line. Refer to Section 3 Emergencies Procedures in the event of a generator malfunction.

STARTER GENERATOR

A starter / generator rated at 30 V DC - 200 amps is mounted on the rear upper face of the engine accessory / reduction gear box module. It is a conventional four-pole shunt-field generator with inter-poles and series auxiliary starting windings. The unit is cooled by a built in fan.

GENERATOR CONTROL UNIT (GCU)

The GCU is a solid state sealed unit mounted on the firewall. The GCU controls the voltage output of the generator, protects the airplane electrical system from excessive generator voltage and ensures that the generator will not be subject to the reverse current flow from the battery in excess of a specified value.

The voltage regulator section of the GCU is adjustable. The adjusting screw is covered by a blanking grommet adjacent to the connector.

If the generator voltage exceeds the specified value (32 V + 0.5 V) an internal over volt sensor in the GCU will cause the generator contactor to disconnect.

GCU CIRCUIT BREAKER

The GCU circuit breaker protects the wiring between the generator and the GCU.

GENERATOR RELAY

The generator relay is a solenoid operated bridge type contactor mounted in the relay box on the firewall immediately below the GCU. The relay isolates the generator from the bus until the GCU control switch is placed ON.

The relay will be automatically tripped if the electrical system is subject to over voltage or the generator to a reverse current flow.

GENERATOR MASTER SWITCH

The GEN switch is located to the immediate left of the BATT switch in the left hand switch panel The GEN switch has three positions ON, OFF and RESET.

The RESET position is a momentary type (spring loaded back to OFF) and is used by the pilot to attempt to bring the generator on line in the event of the generator going off line. Refer to Section 3 Emergencies Procedures in the event of a generator malfunction.

The switch (via the GCU) operates the pull-in coil of the generator relay and applies power to the shunt field of the generator.

GENERATOR CIRCUIT BREAKER

The 10 amp GEN circuit breaker is a standard single pole with manual trip / reset button, it is located in the left hand switch panel marked GEN. This circuit breaker provides protection for the generator system in the event of an excessive current drain in the generator shunt field circuit.

GENERATOR WARNING LIGHT

The red generator warning light marked GENERATOR OFF is contained in the annunciator panel. The light is connected to both battery and generator systems and will illuminate when the BATT switch is placed ON and extinguish when the generator comes on line. Should the generator output fail the warning light will be illuminated.

COMPONENTS COMMON TO THE BATTERY AND GENERATOR SYSTEMS

BATTERY MASTER SWITCH

A single pole, single throw, BATTERY MASTER (BATT) switch is located in the switch panel. When placed in the ON position it provides an earth for the operating coil of the master relay which allows the battery to come on line and supply power to the bus via the ammeter.

VOLT/AMMETER

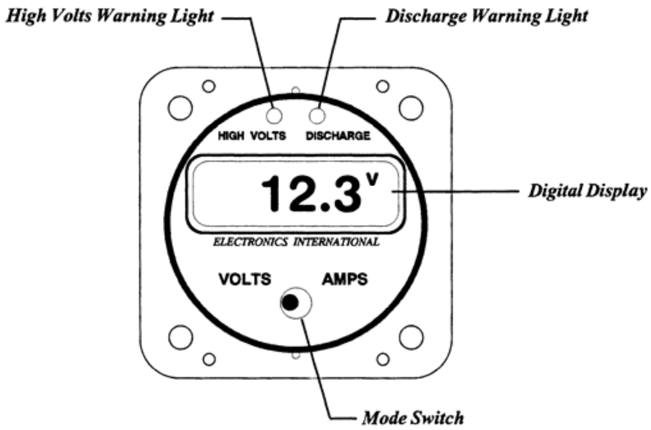


Figure 7-21, Volt/Ammeter

The Electronics International VA-1A combined volt/ammeter, as shown in Figure 7-21, is located in the centre of the instrument panel.

The instrument comprises a HIGH VOLTS warning light, a DISCHARGE warning light, a mode switch and a digital display.

The bright red HIGH VOLTS warning light will illuminate when the bus voltage rises to 30.6 V or higher. The high volts feature is sensed off the red power lead and will function regardless of what position the switch is in.

The bright yellow DISCHARGE warning light will illuminate when bus voltage drops below 25.2 V. The discharge warning feature is sensed off the red power lead and will function regardless of what position the switch is in.

The digital display will display volts in .1 increments and a “V” will show in the display. Amperage will be displayed in .1 amp increments and an “A” will show in the display.

The mode switch changes the display between volts and amps. The setting of this switch will not affect the operation of the HIGH VOLTS or DISCHARGE warning lights.

The following paragraphs describe operating characteristics of the volt/ammeter with the BATTERY MASTER switch on and the engine off:

> With the mode switch in the AMPS position, the volt/ammeter will display the electrical system load on the airplane. Since the engine is off, all of the current is being supplied by the battery. The volt/ammeter will show a discharging condition (the DISCHARGE light will be on) and display an accurate reading of the total current drain from the battery. In this mode of operation any piece of electrical equipment can be checked for proper operation by performing the following steps:

A. Note the amps reading on the volt/ammeter.

B. Turn on the piece of electrical equipment to be checked.

C. If this piece of electrical equipment is working properly an increase in load current that corresponds to the current that piece of equipment requires will be seen.

Using this method with the digital display of the volt/ammeter many important airplane functions (strobes, radios, transponder, ADFs, DMEs, pitot heat, etc) can be checked from the pilot's seat.

With the mode select switch in the VOLTS position, the volt/ammeter will display the bus voltage to .1 V. Each battery has its own operating voltage when charged. As the battery gets near the end of its life, this voltage will start to drop. A discharged battery will also run at a lower voltage.

The following paragraphs describe operating characteristics of the volt/ammeter with the BATTERY MASTER Switch on and the engine on:

With the mode switch in the AMPS position the volt/ammeter the current will increase and will decrease as the battery takes a charge.

Load current cannot be monitored during flight. The generator is supplying all of the electrical load and charging the battery. Only the battery charging current can be monitored.

With the mode selector switch in the VOLTS position the volt/ammeter will display the bus voltage to .1 V. With the engine running the generator is capable of raising the bus voltage to a dangerously high level. It is the voltage regulator's job to limit the bus voltage. A low voltage reading will cause the battery to charge very slowly. A high reading can damage the battery and most of the electrical equipment. If the airplane bus voltage goes to a dangerously high level a bright red HIGH VOLTS light on the volt/ammeter will warn of this condition. If this happens turn the generator off to eliminate the over voltage condition.

Another common electrical problem is a discharging condition. If this condition goes unnoticed the result will be a dead battery in flight rendering all electrical equipment useless. To help avoid this situation the volt/ammeter warns you as soon as the battery goes into a discharging condition. The amount of discharging current can be displayed in the AMPS position. Discharging current will be displayed as a minus number. If this situation occurs, turn off any unnecessary electrical equipment. The lower the pilot can get the discharging current, the longer the battery will last.

The volt/ammeter will display trend information when the battery is in a discharging condition. As the battery discharges .1 V at a time, it is possible to judge the remaining time before the battery reaches a seriously low condition. The exact voltage at which each piece of equipment will start to malfunction depends on the design of that equipment. The volt/ammeter will work accurately from 40 to 7 V – far below where most electrical equipment starts to fail.

CIRCUIT BREAKERS

Two trip-free types of circuit breakers are used; single pole, with manual trip / reset button (a white band around the button becomes visible when the breaker is tripped) and single pole, combination switch/circuit breaker (the switch toggle returns to OFF when breaker is tripped).

The amps rating of the circuit breaker is etched on the end of the button or switch toggle. Circuit breakers are mounted in the switch panel and are connected directly to the bus bar. The circuit breakers are detailed in Figure 7-22.

WARNING

Do not operate the airplane with a tripped circuit breaker without a thorough understanding of the consequences.

CIRCUIT BREAKER NOMENCLATURE	AFFECTED EQUIPMENT/ SERVICE	AMPS
PORT T & B	Pilot's turn & slip	5
PORT DG	Pilot's directional gyro	5
PORT AH	Pilot's artificial horizon	5
MISC	Stall warning vane	5
ITT	ITT indicator	3
AUDIO	Audio panel	3
BUS 1	Refer Supplement 16	50
AV 1	COM/NAV1, DME	20
AV1-AV2 BUS LINK	Bus link	25
AV 2	Transponder, COM 2, ADF	20
BUS 2	Refer Supplement 16	50
FLAP PWR	Flap drive motor	35
FLAP CON	Flap control	5
FLAPS	Flap system	10
ANN PANEL	Annunciator panel	3
TQ IND	Torque indicator	3
P3 HEAT	Engine P3 heat	5
TRIMS	Trim indicator	5
DME	DME	5
REM GYRO	Remote compass system gyro	3
AV FAN	Avionics cooling fan	3
NAV 1, GPS NAV 1	Navigation/GPS 1	5
GPS COM 1, COM TX 1	COM 1 Transmitter	10
NAV 2	GPS 2	5
GPS COM 2	GPS COM 2	10
TXPDR	Transponder	5
ENCODE/ENCODER	Altitude encoder	3
ADF	ADF	3
AMPLIFIER/SPKR	Amplifier	5
CD/STEREO	CD/Stereo player	5
STBD T & B	Right hand turn & slip	5

CIRCUIT BREAKER NOMENCLATURE	AFFECTED EQUIPMENT/ SERVICE	AMPS
STBD DG	Right hand directional gyro	5
STBD AH	Right hand artificial horizon	5
GCU	GCU	10
IPS/INERTIAL SEPARATOR	Inertial Separator	5
PITOT	Pitot heater	10
START	Start Switch	10
IGN	Ignition	5
FUEL/FUEL PUMP	Electric fuel pump	10
GEN	Generator	10
DEMIST *	Windscreen demist	5
OIL COOL	Oil cooler heater	5
INST LT*	Instrument lights	5
JUMP LT *	Jump lights	5
CAB LT *	Cabin lights	5
STROBE *	Strobe lights	5
LDG LT *	Landing lights	10
NAV LT *	Navigation lights	5
DIGITAL INST # 1 DIG INST 1	Ng indicator, Clock, fuel quantity indicator rear tanks, fuel system indicator, volt/ammeter	3
DIGITAL INST # 2 DIG INST 2	Np indicator, fuel quantity indicator front tanks, oil temperature/pressure indicator, OAT indicator,	3

* Switch/circuit breaker

Figure 7-22, Circuit Breakers

GROUND POWER RECEPTACLE

Ground power can be connected to the airplane using the socket located on the right hand rear fuselage. With ground power connected and turned on switching the BATTER MASTER switch ON will connect ground power to the bus bar. A green warning light marked EXTERNAL POWER will illuminate in the annunicator panel when external power is connected to the airplane.

START SWITCH

The START switch is a spring loaded toggle type switch located on the left hand side switch panel. The switch has three positions, START, OFF and INTER/INTERRUPT.

The START switch energises the ignition and engine starting circuits. Selecting INTER/INTERRUPT will de-energise the ignition and engine starting circuits.

IGNITION SWITCH

The ignition switch labelled IGN/IGNITION has three positions, AUTO, CONT/CONTINUOUS and OFF. The AUTO position arms ignition so that ignition will be obtained when the starter switch is activated. This position is used during all ground starts and during air starts with starter assist. The CONT/CONTINUOUS position is for ignition whilst in flight.

7.18 LIGHTING SYSTEMS

NAVIGATION/STROBE LIGHTS

The Whelen combination navigation/strobe beacon system comprises two wing tip light units, a power supply unit, a 5 amp navigation lights switch circuit breaker, a 5 amp strobe lights switch circuit breaker and associated wiring.

The left hand and right hand wing tip mounted light units combine the conventional red/green wing lights with flash tubes for the strobe lighting. A white navigation light is mounted on the tail of the airplane. The navigation lights are controlled by using the ON/OFF switch in the switch panel marked NAV LT. The strobe lights are controlled using the ON/OFF switch in the switch panel marked STROBE.

If the strobe or navigation light switch trips, attempt one reselection to ON. Seek technical assistance if the switch trips a second time.

WARNING

The strobe lights should be turned off when operating in or in the vicinity of cloud as the reflection of the lights off the cloud may lead to disorientation.

LANDING LIGHTS

The landing light system comprises two 28 V 100 watt sealed beam lights, a 10 amp switch/circuit breaker and associated wiring. The landing lights are located in the wing leading edge, inboard of the wing tip. The light assemblies are secured at three points by spring loaded screws which also provide angular adjustment. A pre formed plexiglass cover is fitted over the unit.

The circuit wiring runs from the switch/circuit breaker in the switch panel through the wing looms conduit to the light assemblies, disconnects are provided at the wing break points and spade terminals at the lights. The lights are earthed back at the wing outboard rib.

The landing lights are operated by an ON/OFF switch in the switch panel marked LAND LT.

INTERIOR LIGHTS

The airplane is equipped with lighting for the instrument panel and pedestal. Lighting is controlled using the switch in the switch panel marked INST LT. Lighting intensity is controlled by the four knobs located on the pedestal.

7.19 CABIN VENTILATION

Ambient air is ducted from the forward left hand NACA duct immediately forward of the left hand exhaust pipe. The air is directed through a flexible duct to the left and right hand vents located on the instrument panel. The flow into the cockpit is controlled using the control located on the left side of the pedestal marked “ CABIN AIR PULL COLD” Pulling the lever opens an aperture on the firewall which allows air to flow into the cockpit through the vent.

For airplane’s fitted with rear cabin ventilation ambient air flow is sourced from NACA ducts located on the under side of the left and right leading edge root extensions. Flow is controlled by pulling for on or pushing for off two controls located on the floor on the left side of the pilot’s seat. The controls are marked “PORT” and “STBD”. The “PORT” control is used to control the flow of air to the vents on the left side of the rear cabin and the “STBD” control for control of the airflow to the vents on the right side of the rear cabin.

7.20 PITOT STATIC SYSTEM

GENERAL

The pitot static system comprises a pitot head with pitot heat mounted on the right hand wing tip. Flush mounted static ports on either side of the rear fuselage and drains located on the underside of the rear fuselage.

The pitot static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, vertical speed indicator and altimeter.

PITOT HEATER

The pitot heating system comprises an electric heating element, which is an integral part of the pitot tube and head assembly mounted on the right hand wing tip, and a 10 amp circuit breaker located in the switch panel in the cockpit, a warning light in the annunciator panel and associated wiring.

The pitot heat switch is located on the switch panel and is marked PITOT. The purpose of the pitot heater is to maintain proper operation of the pitot tube during flight in possible icing and heavy moisture conditions.

The amber coloured warning light marked PITOT HEAT INOPERATIVE indicates the pitot heat is either selected OFF or if selected ON the heating element in the pitot head is defective.

7.21 STALL WARNING SYSTEM

The lift detector vane / switch, located in the right hand leading edge of the centre wing, operates the stall warning system to provide audible warning to the pilot of impending stall. The warning horn will sound approximately 5 -10 knots above stalling speed. The horn is located in the overhead panel adjacent to the pilot’s seat. The system can be checked by turning on the airplane BATTERY MASTER switch and then lifting the vane on the wing and checking for an audible noise from the horn.

A voice alert is also transmitted through the pilot headset in airplane’s fitted with the cockpit voice annunicator.

7.22 AVIONICS

The airplane can be configured with a wide range of avionics equipment. The details on fitted avionics equipment are included in Section 9 Supplements.

Crew intercommunication is through an audio panel and intercommunication unit with two sets of headphone jacks.

A press to transmit switch is located on the control column.

Avionics Master switches on the switch panel controls power to the radios. It is suggested the individual radios power controls are left on and power to the avionics is controlled using the Avionics Master switches.

7.23 CABIN FEATURES

CABIN FIRE EXTINGUISHER

A 0.9 kg (1.98 lbs) portable fire extinguisher is located between the pilot and front passenger seat. The fire extinguisher bottle pressure should be checked before flight to ensure the pressure is in the green range and that the extinguisher is secure.

To operate the fire extinguisher:

Release the retaining clamp and lift the extinguisher from the bracket.

Pull out the red plastic pin.

Hold the extinguisher upright, aim the extinguisher at the base of the fire.

Press the lever and sweep the extinguisher from side to side.

WARNING

Ventilate the cockpit after extinguishing the fire to minimise exposure to gases from the fire.

CAUTION

Do not place the extinguisher too close to the fire in case the force of the fire extinguisher blows material around the cockpit.

AXE

An axe is located in the container located in the floor between the pilot's seat and front passenger seat.

FIRST AID KIT

A first aid kit is located in the container located in the floor between the pilot's seat and front passenger seat.

7.24 EMERGENCY LOCATOR BEACON

An ARTEX emergency locator beacon is fitted to the airplane. The system comprises a control unit located in the rear fuselage adjacent to the airplane battery, an externally mounted antenna and an ON/ARM switch in the instrument panel.

CAUTION

Before vacating the airplane after flight the airplane VHF communications radio should be tuned to 121.5MHz to ensure the airplane emergency locator beacon is not activated. If it is activated an audible beacon transmission will be heard in the headset.

7.25 SPEED WARNING HORN

A speed warning horn is fitted to the airplane. The speed warning system will alert the pilot that VNE has been exceeded. The system comprises a pressure switch mounted under the pilot's seat and a horn mounted in the overhead panel adjacent to the pilot's head. The pressure switch is plumbed into the pitot and static systems of the airplane and activates the horn to warn the pilot.

7.26 OIL COOLER HEATER

A heater is fitted to the NACA duct on the right-hand side of the engine cowl which feeds air into the oil cooler. The purpose of the heater is to prevent the NACA duct from being blocked by ice and or snow. Section 3 details the conditions of use.

A heater is fitted to the NACA duct on the right-hand side of the engine cowl which feeds P3 air from the engine take off point and passed by a regulator to stainless steel sleeve on the oil cooler intake lip. Heated air is fed into the oil cooler. The system comprises a 5 amp switch/circuit breaker labelled "OIL COOL" in the left hand switch panel.

LEFT INTENTIONALLY BLANK

SECTION 8

HANDLING, SERVICING AND MAINTENANCE

TABLE OF CONTENTS

8.1 INTRODUCTION

This section contains the precautions and procedures recommended by the factory for the correct handling, servicing and routine care of the airplane.

A planned schedule of lubrication and maintenance should be followed to ensure maximum utilisation of the airplane, the airplane maintenance manual includes a suggested schedule and lubrication chart.

The identification and procurement procedures for spare parts is contained in the airplane illustrated parts list.

WARNING

The airplane should be inspected and maintained in accordance with the airplane Maintenance Manual, Service Bulletins and Service letters. Pacific Aerospace Corporation Limited does not encourage or support modifications to the airplane unless approved by Pacific Aerospace Corporation Limited. Modifications not approved by the Pacific Aerospace Corporation Limited may affect the operation of the airplane as detailed in all sections of this handbook and therefore put the airplane and occupants at risk. Modifications not approved by the Pacific Aerospace Corporation Limited to the airplane may affect any warranty conditions.

8.2 IDENTIFICATION

A manufacturers identification plate which includes the airplane serial number, type certificate, model number and date of manufacture is attached to the left hand side rear fuselage adjacent to the tail plane leading edge. All correspondence relating to the airplane should include the airplane serial number.

8.3 PUBLICATIONS

When the airplane is delivered from the factory, it is accompanied by a pilot's operating handbook/flight manual, maintenance manual and illustrated parts catalogue. Further copies of these manuals may be purchased as required from Pacific Aerospace Corporation Limited

8.4 AIRPLANE FILE

A number of certificates and documents pertaining to the airplane are contained in an ‘Airplane File' supplied with each airplane which together with any additional data that may be required by the appropriate airworthiness authority should be maintained as a permanent record of the airplane. Applicable regulations should be checked periodically to ensure the file is up to date.

log books for airframe, engine, propeller and radio (when required) are supplied by the manufacturer.

8.5 AIRPLANE INSPECTION PERIODS

The manufacturer recommends 150 hour or 1500 landing, whichever occurs first, inspection cycles, with 'before', 'after' and 'between' flight inspections. The airplane maintenance schedule (refer maintenance manual) has been compiled to accommodate these cycles.

New Zealand registered airplane must conform to the requirements laid down by the New Zealand Civil Aviation Rules regarding airworthiness.

Airplane not on the New Zealand register will comply with the regulations issued by the airworthiness authority in the country of registration, regarding airworthiness certificates and inspection periods.

Airworthiness authorities may require other inspections, for which an airworthiness directive is issued applicable to the airframe, engine, propeller or other components. When these inspections are repetitive, they should be added to the maintenance schedule.

8.6 PILOT'S MAINTENANCE

A pilot appropriately trained by a LAME and authorised by an owner/operator may perform pilot maintenance.

If the airplane is registered outside New Zealand, then the regulations of the country of registration will determine the extent of 'pilot maintenance' that may be performed by the pilot.

A maintenance manual must be available prior to performing any ‘pilot maintenance’ to ensure correct procedures are followed. Pilot maintenance must be accomplished in accordance with the airplane maintenance manual.

CAUTION

Any maintenance and servicing not included in the permissible 'pilot maintenance' must be accomplished by appropriately authorised personnel.

8.7 GROUND HANDLING

TOWING

Whether the airplane is towed by hand or by power it is most easily and safely achieved using an approved tow bar fitted to the nose wheel. Connect the nose steering bar, position one person in the cockpit to apply the brakes and ensure the propeller has one blade vertical (12 o'clock position).

All towing should be carried out at slow speeds.

Care should be exercised when towing over rough ground to limit the loads on nose wheel steering.

CAUTION

When moving the airplane avoid pushing or pulling on the following areas: outer half of propeller blades, control surfaces, flaps, tail-cone, wing tips, spinner, aerials and leading edge fuel tanks.

NOTE

The nose wheel steering mechanism has an angular movement of 20^o either side of the airplane centre line, if this movement is exceeded, damage to the rudder / steering travel stops will result.

PARKING

Park the airplane heading into wind, apply the parking brake as follows:

Depress the toe brake pedals.

Pull out the parking brake knob and hold.

Release the toe brake pedals.

Release hold of the parking brake knob

To release the parking brake, depress the toe pedals, push in the park brake knob, then release the toe pedals.

NOTE

Do not apply the parking brake when the brakes are in an overheated condition or when accumulated moisture may freeze the brakes on.

NOTE

Do not leave the park brake on for extended periods or where the ambient air temperature may rise sufficiently to expand the trapped fluid and damage the system.

Install the control column lock.

Chock the wheels front and rear.

Close and latch the crew entry doors and cargo door.

Ensure the pitot head cover is fitted.

Fit engine inlet and exhaust covers.

Fit propeller restraint.

The following precautions are recommended to prevent heat deformation of transparent plastic enclosures on airplane parked exposed to the sun:

If surrounding air temperature is below 38ºC (100ºF), no special precautions are necessary.

If surrounding air temperature is between 38ºC (100ºF) and 49ºC (120ºF) enclosures should be opened sufficiently to permit free circulation of air through the airplane and under the enclosure.

If the surrounding air temperature is above 49ºC (120ºF) the enclosure must be opened and protected from the sun by a suitable cover which does not come into contact with the transparent plastic. If possible the airplane should be parked in the shade.

To remove enclosure covers lift them off; sliding may cause abrasion of the plastic surfaces.

MOORING

To tie the airplane down carry out the parking procedures, then secure the airplane at the wing and tail tie down rings to tie down points or stakes with sufficiently strong rope or chains.

NOTE

When using natural fibre ropes, leave sufficient slack to compensate for shrinkage when wet.

JACKING

When it is necessary to perform any jacking of the airplane, or raising the nose for maintenance, reference should be made to the maintenance manual for the correct procedure and equipment required.

LEVELLING

Level the airplane as described in Section 6 for weighing or refer to the airplane maintenance manual for levelling procedures associated with maintenance activities.

8.8 SERVICING

INTRODUCTION

In addition to the pre-flight inspection detailed in Section 4, information on servicing, inspection, maintenance and test requirements is contained in the maintenance manual. The maintenance manual details all items that require periodic maintenance plus those that require servicing, inspection and / or testing at special intervals.

The following procedures, quantities and specification of frequently serviced items are mentioned for quick and ready reference.

FUEL

APPROVED FUELS

Approved fuels are detailed in Figure 8-1. Refer to P&WC S.B. No. 1344 for specific details.

APPROVED FUELS	
Jet A /A1 (ASTM D1655)	
Jet B (ASTM D1655)	
JP-4 (MIL-T-5624)	Contains fuel system ice inhibitor
JP-5 (MIL-T-5624)	Contains fuel system ice inhibitor
F-40 (NATO Code)	Contains fuel system ice inhibitor
F-34 (Nato Code)	Contains fuel system ice inhibitor
F-44 (Nato Code)	Contains fuel system ice inhibitor

Figure 8-1, Approved Fuels

FUEL TANK CAPACITY

The airplane fuel capacity is detailed in Figure 8-2.

Total Capacity: 861 litres (227.4 U.S. gallons, 1512 lbs)

Total Useable: 841 litres (221 U.S. gallons, 1476 lbs)

TANK	TOTAL CAPACITY	UNUSABLE FUEL	USABLE
FRONT LEFT TANK *	284* litres, 499 lbs 75* U.S. gallons	10 litres, 18 lbs 3 U.S. gallons	274 litres, 481 lbs 72 U.S. gallons
FRONT RIGHT TANK	293 litres, 515 lbs 77 U.S. gallons	10 litres, 18 lbs 3 U.S. gallons	283 litres, 497 lbs 74 U.S. gallons
REAR LEFT TANK	142 litres, 249 lbs 37.5 U.S. gallons	0	142 litres, 249 lbs 37.5 U.S. gallons
REAR RIGHT TANK	142 litres, 249 lbs 37.5 U.S. gallons	0	142 litres, 249 lbs 37.5 U.S. gallons
TOTAL	861 litres, 1512 lbs 227 U.S. gallons	20 litres, 36 lbs 6 U.S. gallons	841 litres, 1476 lbs 221 U.S. gallons

* Includes 26 litres (6.8 U.S. gallons) of fuel in sump tank

Figure 8-2, Fuel Capacity

CAUTION

The accuracy of the fuel indicating system will be affected is the airplane is parked on sloping ground.

REFUELLING

Each of the four wing tanks is fitted with a filler aperture. Access to the tanks is achieved by removing the fuel tank cap.

Fuel may be introduced into the airplane by either pouring or pumping. When fuelling by pouring from containers ensure that the fuel is adequately filtered, ie. chamois leather and funnel.

Fill the front tanks first.

Observe the following precautions whilst refuelling:

A. Fuelling must be carried out in the open.

B. Ensure purity of fuel. Use an approved detector kit to determine water suspension.

C. Ensure correct bonding of airplane, filling hose and refuelling equipment.

D. Ensure adequate fire appliances are available.

E. Ensure NO SMOKING within 100 ft (30m) of the airplane.

F. Ensure all airplane electrical systems are de-energised.

G. If fuel is spilled ensure the area of spillage is thoroughly flushed with water and that all residual fuel and vapour have been dispersed before attempting to start the engine.

H. Ensure fuel tank caps are securely installed on completion of refuelling.

I. Complete a fuel check for contamination from the four fuel tank drains, sump tank drain and the fuel filter drain.

Use a clear sampler to drain a fuel sample from each of the fuel drains. Fill the sampler up and hold the sampler up to the light to allow a clear view of the fuel in the sampler. If any contamination is present clean the sampler and take repeated samples from all drains until the fuel is free of contamination. The airplane fuel tanks should be completely drained of all fuel and cleaned if evidence of contamination remains after repeated fuel sample checks.

WARNING

It is the pilot's responsibility to ensure the airplane's fuel supply is suitable to use before flight. Fuel should be checked to ensure that it is a fuel type approved for use in the airplane and that it is free from all types of solid and liquid contamination. A fuel sample is required during each pre flight inspection and after each refuel.

WARNING

The airplane must not be flown with fuel in the rear tanks unless the front tanks are full.

DEFUELLING

The airplane may be de-fuelled either by draining or syphoning. Complete the de-fuelling operation by opening the quick-drain plug fitted to the base of each tank and sump tank.

WARNING

When syphoning fuel from the tanks, use only safety approved equipment, never attempt to commence syphoning by mouth. Introduction of even small quantities of fuel into the lungs may prove fatal

NOTE

The precautions listed under REFUELLING must be observed when de-fuelling by either method.

OIL

INTRODUCTION

Access to the oil dipstick/filter cap is via a small hinged panel on the left side of the upper engine cowl. The oil tank is an integral part of the compressor inlet case and is located in front of the accessory gearbox. The oil filler neck protrudes through the accessory gearbox and is closed by a cap which incorporates a quantity measuring dipstick. The markings on the dipstick correspond to U.S. quarts and indicate the oil level below the maximum capacity of the oil tank. Normal cold oil level is MAX COLD mark on the dipstick. Normal hot oil level is the MAX HOT mark on the dipstick.

Filling the oil to the maximum level may result in a high consumption rate, with the oil exiting through the accessory gearbox breather. On some engines, this may also occur with the oil level at one or two U.S. quarts below the maximum level. In such cases, operators are advised to service the oil to the level that results in acceptable consumption down to 3 quarts below the maximum. This practice is acceptable, due to the large usable oil quantity. Oil temperature and pressure indications should be monitored and consumption rates monitored and checked against the engine maintenance manual recommendations.

OIL TANK CAPACITY

	U.S. GAL		**IMPERIAL GAL.**	
Total capacity of tank	2.3	2.7	1.9	2.16
Quantity of useable oil	1.5	1.5	1.2	1.2

Figure 8-3, Oil Tank Capacity

OIL SPECIFICATIONS

The approved oil brands and types are detailed in Figure 8-4. Refer to P&WC S.B 1001 for full details.

BRAND	TYPE
AeroShell Turbine Oil 750	Synthetic, CPW202 (7.5 Centistokes)
Royco Turbine Oil 750	Synthetic, CPW202 (7.5 Centistokes)
Castrol 98	Synthetic, CPW202 (7.5 Centistokes)
BP Turbo Oil 274	Synthetic, CPW202 (7.5 Centistokes)
Turbonycoil 35 M	Synthetic, CPW202 (7.5 Centistokes)
AeroShell Turbine Oil 500	Synthetic, PWA 521- Type II (5 Centistokes)
Royco Turbine Oil 500	Synthetic, PWA 521- Type II (5 Centistokes)
Mobil Jet Oil II	Synthetic, PWA 521- Type II (5 Centistokes)
Castrol 5000	Synthetic, PWA 521- Type II (5 Centistokes)
BP Turbo Oil 2380	Synthetic, PWA 521- Type II (5 Centistokes)
Turbonycoil 525-2A	Synthetic, PWA 521- Type II (5 Centistokes)
Turbonycoil 600	Synthetic, PWA 521- Type II (5 Centistokes)
Mobil Jet Oil 254	Synthetic, PWA 521- Type II (5 Centistokes),THIRD GENERATION
AeroShell Turbine Oil 560	Synthetic, PWA 521- Type II (5 Centistokes),THIRD GENERATION
Royco Turbine Oil 560	Synthetic, PWA 521- Type II (5 Centistokes),THIRD GENERATION

Figure 8-4, Oil Specifications

CAUTION

Only use oil which meets the specifications listed in Pratt & Whitney Engine Service Bulletin No 1001 PWC. Do not mix different viscosities or specifications of oil as their different chemical structure can make them incompatible. Drain the complete oil system before changing oil viscosities or specifications.

CAUTION

When changing from an existing lubricant formulation to a "Third Generation" lubricant formulation P&WC strongly recommends that such a change should only be made when an engine is new or freshly overhauled.

NOTE

Where operation will result in frequent cold soaking at ambient temperature of -18^{0}C (64.4^{0}F) or lower, use of a 5 centistoke oil is recommended.

CHECKING OIL LEVEL

The oil level is best checked when the engine is warm. The preference is to check the oil level within 10 - 20 minutes after shut down (MAX HOT marking on the dip stick is used). If the engine has been shut down for more than 30 minutes and the engine is warm run the engine before checking the oil level. The MAX COLD mark on the dip stick is used to check oil levels when the engine is completely cold.

MAXIMUM OIL CONSUMPTION

The maximum oil consumption is 0.2 lb./hr. For better accuracy, consumption should be monitored over a 10 hour period 2 lb/10 hrs, (2 lbs. = 1 U.S. quart approx).

WARNING

Ensure the oil dipstick is fitted and locked before engine operation. Loss of oil due to an insecure oil cap will result in excessive loss of oil and eventual engine stoppage.

BRAKE FLUID

Replenish the brake hydraulic fluid using hydraulic fluid to specification MIL-H-5606A; ensure oil is uncontaminated; do not reuse oil drained from the system as this may be both contaminated and aerated.

A. Ensure the parking brake is OFF.

B. Remove engine upper cowling.

C. Remove the filler plug from the brake system reservoir.

D. Top up the reservoir, avoid overfilling and subsequent spillage.

BATTERY ELECTROLYTE

The airplane is fitted with a regenerative gas maintenance free battery. No battery electrolyte replenishment is permitted.

TIRE INFLATION

The following tIre pressures are recommended for normal operations:

Main landing gear tires	40 psi
Nose landing gear tires	30 psi

CLEANING AND CARE

The airplane should be maintained in a clean condition both internally and externally as a pre-requisite to efficient servicing and maintenance.

EXTERNAL CLEANING

The paint finish on the airplane is long lasting and weather resistant. Damage to the finish should be restored as soon as possible by feathering edges, cleaning area with solvent and applying primer and top coat.

Clean the airplane externally by washing with clean water and mild soap or detergent.

CAUTION

Use only clean cold water and mild soap during initial curing period of paint.

A good quality automotive wax may be applied to the exterior paint work if desired.

Oil or grease spots may be removed with kerosene or mineral spirits.

INTERNAL CLEANING

Clean the interior of the airplane with a vacuum cleaner to remove dust, dirt and loose articles.

Regular cleaning will prolong the life of upholstery. A damp cloth is recommended for general cleaning. For accumulated dirt or more stubborn solid areas, a mild detergent and water mixture should be employed.

CAUTION

Do not use solvents as they may damage upholstery.

TRANSPARENCY CLEANING

CAUTION

Damage to transparencies will be minimised if the correct cleaning procedures are followed.

Routine removal of film and other operational soiling, where abrasive polishing for scratch removal is not required, can be accomplished by the use of aqueous detergents solutions of 2 or 3 oz per gallon of water. The fluid should be applied with soft cloths or cellulose sponges which have been used for no other purpose.

When cleaning surfaces always remove rings from the hands before washing the transparent plastic. The cleaning procedure comprises the following steps:

A. Flush the plastic surface with plenty of water, using bare hands to feel for and gently dislodge any dirt, sand or mud.

B. Wash with mild soap and water. Be sure the water is free of harmful abrasives. A soft cloth, sponge, or chamois may be used in washing, but only to carry the soapy water to the plastic. Go over the surface with bare hands to quickly detect and remove any remaining dirt before it scratches the plastic.

C. Dry with a damp clean chamois, a clean soft cloth, or soft tissue. Do not continue rubbing the transparent plastic after it is dry. This not only scratches, but may build up an electro static charge which attracts dust particles. If the surface becomes charged, patting or gently blotting with a clean damp chamois will remove the charge as well as the dust.

D. Never use a coarse or rough cloth for polishing, cheesecloth is not acceptable.

The procedure for cleaning interior surfaces comprises three steps:

E. Dust the plastic surface lightly with a clean soft cloth saturated with clean water. Do not use a dry cloth.

F. Wipe carefully with a damp soft cloth or sponge. Keep the cloth or sponge free from grit by rinsing it frequently with clean water.

E. Clean with an approved cleaner.

PROPELLER

Clean the propeller with a mild soap and water. Refer to the Hartzell Owner's Manual for further detail.

ENGINE

Refer to the Pratt & Whitney Maintenance Manual for the airplane engine for cleaning procedures including compressor wash details.

8.9 PROLONGED OUT-OF SERVICE CARE

The length of time and environment that the airplane is expected to be out of service will determine the extent to which the airplane and systems are prepared for periods of inactivity. It is not possible to cover every eventuality but the following guidelines will assist in determining the extent of the preparation. Airplanes and the associated systems, like any other mechanised item, need a certain amount of activity to reduce deterioration of systems and parts. Long periods of inactivity may result in faster deterioration compared to if the airplane was in service.

HANGARAGE

Airplanes will always benefit from being hangared compared to parked outside, whether overnight or for longer periods. Refer to Towing in this section for details on moving the airplane. Exercise caution manoeuvring the airplane in and out of the hanger. A dust cover will further assist to keep any dust and foreign debris from settling directly on the airplane. Try and locate the airplane clear of any areas where it might be in the way of other activities that occur in the hanger. If possible consider leaving the park brake OFF so that the airplane can be quickly moved in the event that the hanger is required to be cleared in a hurry. Ensure the control lock, pitot heat, engine inlet and exhaust covers and propeller restraint are fitted and doors all closed. Ensure the airplane MASTER switch is turned off.

PARKING AND MOORING

Follow the procedures detailed in Parking and Mooring in this section for securing the airplane outside. When storing for prolonged periods make every effort to find an area to secure the airplane which is clear of other activities which occur on or in the vicinity of the intended parking area. If not familiar with the area speak to someone who is.

ENGINE

Preservation of engines in service depends on the period of inactivity and whether or not the engine may be rotated during the inactive period. An engine is considered inactive when it has not been operated either on the ground, or in flight for a minimum of ten minutes after the oil temperature has stabilized.

Any preservation done should be entered in the logbook and on tags attached to the engine.

For an engine inactive in a severe environment such as extreme temperature changes, high humidity, dusty, polluted or salt laden atmosphere, it is recommended that the engine be preserved to the next higher schedule or the engine started and run more frequently, for a minimum of ten minutes each time.

The engine preservation and depreservation procedures are detailed in the Pratt & Whitney Maintenance Manual. Preservation and the associated depreservation requirements start after the engine has been inactive for more than 7 days. Refer to the Pratt & Whitney Maintenance Manual for the PT6A-34 for detailed procedures.

BATTERY

To safe guard against deterioration of the battery condition consideration should be given to disconnecting the battery from the airplane at the battery.

RETURNING TO SERVICE

Ensure the applicable engine depreservation requirements are completed. Ensure all covers and mooring apparatus are removed from the airplane. Reconnect any airplane systems which were disconnected. Conduct a thorough preflight of the entire airplane. Pay particular attention to the engine oil quantity and condition, fuel quantity and condition, battery condition, tire inflation, vents, ducts and intakes. During and after start pay particular attention to the airplane systems to ensure the correct functionality and indications.

SECTION 9

SUPPLEMENTS

9.1 INTRODUCTION

This section provides information in the form of supplements which are necessary for safe operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

All of the supplements provided in this section are approved and consecutively numbered as a permanent part of this flight manual.

The information contained in each supplement applies only when the related equipment is installed in the airplane.

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9-18-3	5 December 2006
9-18-4	5 December 2006
9-18-5	5 December 2006
9-18-6	5 December 2006
9-19-1	5 December 2006

Page No.	Date
9-19-2	5 December 2006
9-19-3	5 December 2006
9-19-4	5 December 2006
9-20-1	17 October 2007
9-20-2	17 October 2007
9-20-3	17 October 2007
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9-20-5	17 October 2007
9-20-6	17 October 2007
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9-21-2	5 December 2006
9-21-3	5 December 2006
9-21-4	5 December 2006
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9-22-2	5 December 2006
9-22-3	5 December 2006
9-22-4	5 December 2006
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9-23-2	5 December 2006
9-23-3	5 December 2006
9-23-4	5 December 2006
9-23-5	5 December 2006
9-23-6	5 December 2006
9-24-1	4 December 2007
9-24-2	4 December 2007
9-24-3	4 December 2007
9-24-4	4 December 2007
9-24-5	4 December 2007
9-24-6	4 December 2007
9-24-7	4 December 2007
9-24-8	4 December 2007
9-24-9	4 December 2007
9-24-10	4 December 2007
9-25-1	5 December 2006
9-25-2	5 December 2006
9-25-3	5 December 2006
9-25-4	5 December 2006

LIST OF EFFECTIVE PAGES Cont'd

LIST OF EFFECTIVE PAGES Cont'd

Page No.	Date
9-39-12	5 December 2006
9-40	5 December 2006
9-41-1	5 December 2006
9-41-2	5 December 2006
9-41-3	5 December 2006
9-41-4	5 December 2006
9-41-5	5 December 2006
9-41-6	5 December 2006
9-42-1	17 October 2007
9-42-2	17 October 2007
9-42-3	17 October 2007
9-42-4	17 October 2007
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9-43-2	5 December 2006
9-43-3	5 December 2006
9-43-4	5 December 2006
9-44-1	17 October 2007
9-44-2	17 October 2007
9-44-3	17 October 2007
9-44-4	17 October 2007
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9-45-4	5 December 2006
9-45-5	5 December 2006
9-45-6	5 December 2006
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9-47-6	5 December 2006
9-48-1	17 October 2007
9-48-2	17 October 2007
9-48-3	17 October 2007
9-48-4	17 October 2007

Page No.	Date
9-49-1	5 December 2006
9-49-2	5 December 2006
9-49-3	5 December 2006
9-49-4	5 December 2006
9-49-5	5 December 2006
9-49-6	5 December 2006
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9-50-3	17 October 2007
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9-51-4	29 December 2006
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9-52-3	18 May 2007
9-52-4	18 May 2007
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9-53-2	2 March 2007
9-53-3	2 March 2007
9-53-4	2 March 2007
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9-54-2	27 February 2007
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9-56-4	21 September 2007
9-57-1	24 April 2007
9-57-2	24 April 2007
9-57-3	24 April 2007
9-57-4	24 April 2007
9-57-5	24 April 2007
9-57-6	24 April 2007

LIST OF EFFECTIVE PAGES Cont'd

LIST OF SUPPLEMENTS IN SECTION 9

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