



Baron BE58 Flight Crew Operating Manual

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0 Preface

0.1 Record of Amendments

Rev. No	Date Entered	Amended By

0.2 Revision Highlights

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0.4 General

This Flight Crew Operating Manual (FCOM) has been prepared by the BAVirtual Flight Technical Department.

The purpose of the FCOM is to:

- provide the operating limitations, procedures, performance, and systems information the flight crew needs to safely and efficiently operate the Beech Baron 58 airplane during all anticipated operations
- serve as a comprehensive reference for use during training for the Beech Baron 58 airplane
- establish standardised procedures and practices

The manual is periodically revised to incorporate pertinent procedural and systems information. Items of a more critical nature will be incorporated in operational bulletins and distributed in a timely manner via Flight Crew Notices.

Any questions about the content or use of this manual can be directed to:

Senior Instructors Advanced Flying Training
BAVirtual

The Senior Instructors may be contacted via the [Advanced Flying Training section of the BAVirtual Forums](#).

0.5 Organisation

The FCOM is organized in the following manner.

- Preface – contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and bulletins.
- Limitations and Normal Procedures chapters cover operational limitations and normal procedures. All operating procedures are based on a thorough analysis of crew activity required to operate the airplane, and reflect the latest knowledge and experience available.
- Supplementary Procedures chapter covers those procedures accomplished as required rather than routinely on each flight.
- Procedures and Techniques chapter covers information and recommendations on manoeuvres and techniques, approved by the manufacturer and BAVirtual and accepted by the CAA and VATSIM PTD for use in flight operations. The techniques described in this chapter are the techniques to be taught and practiced within BAVirtual.
- Systems chapter contains general airframe and systems information. These chapters are generally subdivided in to sections covering controls and indicators and systems descriptions.
- Performance chapter contains relevant aeroplane performance information useful for in-flight and planning purposes
- Quick Reference Handbook (QRH) – the QRH covers normal and non-normal checklists (separate volume)

0.6 Statement of Applicability

The FCOM forms part of OM B for the BE58. Other documents which also form part of the BAVirtual BE58 Operations Manual include:

- BAV Flying Club Flying Orders – available via DocStore
- FCOM – this document
- Checklists – available via BE58 DocStore
- Performance Manual – contained within this document
- MEL – contained within BAV Flying Club Flying Orders

0.7 Warnings, Cautions and Notes

The following levels of written advisories are used throughout the FCOM and are not to be confused with EICAS messages, which are separately identified in the text.

WARNING: An operating procedure, technique, etc., that may result in personal injury or loss of life if not carefully followed.

CAUTION: An operating procedure, technique, etc., that may result in damage to equipment if not carefully followed.

Note: An operating procedure, technique, etc., considered essential to emphasize. Information contained in notes may also be safety related.

0.8 Standard Operating Procedures

0.8.1 Introduction

Standard Operating Procedures are standardised procedures used by all persons conducting flight operations. The rationale behind them is safety: if everybody conducts themselves in a standard and predictable pattern there are no surprises or confusion and safety in general is enhanced.

In multi-crew and airline operations, SOPs are a way of life. As BAVirtual Flight Training courses are designed to prepare the student for airline flying, it is logical and appropriate to incorporate SOPs in to these courses.

SOPs are primarily made up of actions and callouts made by crew members during flight, but SOPs also extend in to pre-flight activity.

One way of describing SOPs is as a script which everybody in an airline shares and practices during every flight. As with any script, the content must be memorised.

1 Limitations

1.1 General

This chapter contains:

- Aeroplane Flight Manual (AFM) operational information
- Non-AFM operational information

Information is included if:

- Operationally significant
- Required by another regulatory requirement

Operational information in this chapter that must be memorised is marked with a # symbol. This information is such that flight crew access by reference cannot assure timely compliance, e.g. turbulence penetration speeds. They need only be memorised to the extent that compliance is assured – knowing the exact wording of the limitation is not required.

Assuming the remaining items are available to the flight crew by reference, they do not need to be memorised.

1.2 Aeroplane General Limitations

1.2.1 Operational Limitations

1.2.1.1 Maximum Demonstrated Crosswind Component

#22 knots

1.2.2 RVSM operations

RVSM operations are **not approved**.

1.3 Weight Limitations

1.3.1 Maximum Taxi Weight

5,540 Pounds

1.3.2 Maximum Takeoff Weight

5,500 Pounds

1.3.3 Maximum Landing Weight

5,400 Pounds

1.4 Airspeed Limitations

1.4.1 Never Exceed Speed (V_{NE})

223 KIAS

Do not exceed this speed in any operation.

Marked with a red radial.

1.4.2 Maximum Structural Cruising Speed (V_{NO})

195 KIAS

Do not exceed this speed except in smooth air and then only with caution.

Marked by start of yellow arc.

1.4.3 Manoeuvring Speed (V_A)

#156 KIAS

- Do not make full or abrupt control movements above this speed

1.4.4 Maximum Flap Extension Speeds (V_{FE})

- Approach (15°): 152 KIAS
- Full Down (30°): 122 KIAS

Do not extend flaps or operate with flaps extended above this speed.

V_{FE} Approach Marked with a white triangle. V_{FE} Full marked by white arc.

1.4.5 Maximum Landing Gear Operating/Extended Speed (V_{LO}/V_{LE})

152 KIAS

Do not extend, retract or operate with gear extended above this speed.

Marked with a white triangle.

1.4.6 Single-Engine Minimum Control Airspeed (V_{MCA})

84 KIAS

Minimum speed for directional controllability after sudden engine failure.

Marked with a red radial.

1.5 Automatic Flight Limitations

1.5.1 NAV Mode

#Use of NAV mode to track a VOR radial or GPS track is prohibited during shared cockpit operations.

Basic autopilot modes (e.g. ALT, V/S, HDG etc) may still be used at the discretion of instructors/examiners.

1.6 Powerplant Limitations

1.6.1 Engine Operating Limitations

1.6.1.1 Takeoff and Maximum Continuous Power

Full throttle, 2700 rpm

1.6.1.2 Maximum Cylinder Head Temperature

238°C

1.6.1.3 Maximum Oil Temperature

116°C

1.6.1.4 Minimum Take-off Oil Temperature

#24°C

1.6.1.5 Minimum Oil Pressure (Idle)

10 psi

1.6.1.6 Maximum Oil Pressure

100 psi

1.6.1.7 Starter Time Limitations

#Do not operate starter continuously for more than 30 seconds in any 4 minute period. Allow starter to cool again before cranking.

1.6.2 Fuel Limitations**1.6.2.1 Approved Engine Fuels**

- 100LL (blue)
- 100 (green)
- 115/145 (purple)

1.6.2.2 Minimum Fuel Quantity for Takeoff

#Do not take off if fuel quantity gauges indicate in yellow arc or with less than 13 gallons in each wing fuel system.

1.6.2.3 Fuel Crossfeed

The fuel crossfeed system is to be used during emergency operations in level flight only.

1.6.2.4 Sideslip Limitations

#Maximum sideslip duration 30 seconds.

1.6.3 Centre of Gravity Limitations**1.6.3.1 Forward Limit**

74.0 inches aft of datum at 4,200 lb and under, then straight line variation to 78.0 inches aft of datum at MLW and 78.3 inches aft of datum at MTOW.

1.6.3.2 Aft Limit

86.0 inches aft of datum

1.7 Manoeuvring Limits**1.7.1 Types of Manoeuvres**

The aeroplane is certified in the Normal category. Aerobatic manoeuvres, including spins, are **prohibited**.

1.7.2 Load Factor Limitations

#Flaps Up: +3.8 G

#Flaps Down: +2.0 G

1.8 Flight Crew

The minimum required Flight Crew is one pilot.

1.9 Passenger Seating

The maximum number of passengers is five.

1.10 Icing Limitations

1.10.1 Flight in Icing Conditions

#Sustained flight in icing conditions with flaps extended is prohibited except for approach and landing

1.10.2 Severe Icing Conditions

WARNING: Severe icing may result from environmental conditions outside of those for which the airplane is certificated. Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in ice build-up on protected surfaces exceeding the capability of the ice protection system, or may result in ice forming aft of the protected surfaces. This ice may not be shed using the ice protection systems, and may seriously degrade the performance and controllability of the airplane.

#During flight, severe icing conditions that exceed those for which the airplane is certificated shall be determined by the following visual cues. If one or more of these visual cues exists, immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the icing conditions.

- Unusually extensive ice accumulation on the airframe and windshield in areas not normally observed to collect ice
- Accumulation of ice on the upper surface of the wing, aft of the protected area.
- Accumulation of ice on the engine nacelles and propeller spinners farther aft than normally observed.

#Since the autopilot, when installed and operating, may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.

#All wing icing inspection lights must be operative prior to flight into known or forecast icing conditions at night.

Note: This supersedes any relief provided by the Master Minimum Equipment List (MMEL).

1.10.3 Minimum Airspeed during Icing Conditions

#130 KIAS

1.10.4 Minimum Ambient Temperature for Operation of Deicing Boots

#-40°C

1.10.5 Propeller Deice System

#Do not operate the propeller deice system when propellers are static.

1.10.6 Windshield Heat

#Ground use of windshield heat is limited to 10 minutes at a time.

2 Normal Procedures

2.1 Introduction

2.1.1 General

This chapter gives:

- An introduction to the normal procedures philosophy and assumptions
- Step-by-step normal procedures
- General information regarding the execution of BAVirtual Operational Policy on the BE58

2.1.2 Crew Roles

In multi-crew flying SOPs establish tasks for each crew member – the Pilot Flying, or PF, and the Pilot Monitoring, or PM. Tasks are generally associated with calls and actions (for example, the PF may call “gear up” and the PM raises the gear and responds “gear up”).

In most cases, PF and PM duties are independent of who is Pilot in Command (PIC), i.e. the Captain, or Co-pilot, e.g. the First Officer, with PF and PM duties switching between Captain and Co-pilot on each leg.

During multi-engine training it is not the role of the instructor to function as either PF or PM. However, training can still be conducted in a fashion which best prepares students for an airline-style multi-crew operation. Accordingly, the procedures laid out in this manual are PF-focused, with no procedural responses or inputs from a PM. The PF is, in effect, the student acting as PIC.

As a rule, pilots should never deviate from SOPs; it has been clearly established through research that when deviation occurs there is a much greater probability of an incident or accident. The BAV Beech Baron SOPs must be memorised and practiced during all training flights.

2.1.3 Checklist Layout and Usage

There are two checklist formats used in BAVirtual multi-engine training: “flow checks” and “self-challenge/response”.

2.1.3.1 Flow Checks

The Flow Checks method requires that the checklist sequence is first completed from memory, and then the checklist reviewed to ensure that all items contained on the checklist for the specified phase are double-checked: the items are read from the checklist and physically or visually confirmed.

In BAVirtual BE58 operations, the **Taxi Check** and all airborne checklists from **Before Takeoff (Below the Line)** up to and including **Final** are completed as flow checks. The items are completed silently and then the checklist read aloud, with each item physically or visually confirmed, to verify the appropriate actions have been completed.

The checklists to be conducted using the Flow Checks methods are headed with a blue background.

2.1.3.2 Self-Challenge/Response

In the Self-Challenge/Response method, all items are sequentially completed as the checklist is read aloud. In BAVirtual BE58 operations, the **Before Start, Engine Start**,

After Start and **Before Takeoff (Down to the Line)** checks, plus **After Landing** up to and including **Shutdown** are conducted as self-challenge/response checklists.

The checklists to be completed using the Self-Challenge/Response method are headed with a yellow background.

2.2 Altimeter Settings

Changes to altimeter settings must be confirmed and cross checked on all altimeters.

2.2.1 QNH Operations

Before Takeoff/Below Transition Altitude:

- set QNH

Above Aa and cleared to climb above Transition Altitude:

- set 1013

When cleared to descend to an altitude:

- set QNH

2.3 Crew Briefing

Prior to each flight a crew briefing must be conducted. In the training setting, the instructor will normally first brief the upcoming exercise. A pre-flight briefing must then be completed by the PF.

As a minimum, the briefing should cover:

- Route/areas of operation
- Weather for departure, destination and en-route, comparing minimum requirements with actual and forecast
- NOTAM, ATC and airspace considerations
- Fuel requirement
- Mass and balance calculation
- Any special requirements and 'bottom lines' as appropriate

2.4 Before Start Check

BAV Merlin Initialised
Ensure the flight is booked and all vital data entered. Press the green tick to advance to the ACARS tab.

Seats & Harnesses POSITION AND LOCK
Verify seat and flight control hardware properly positioned, secured as necessary and all controls within comfortable reach. Verify eyepoint set correctly in FS.

Park BrakeON

Gear HandleDOWN

Cowl Flaps OPEN

Fuel ValvesON

Circuit Breakers All IN

Magneto Switches OFF

External Lights OFF

Avionics OFF

Prop Sync OFF

Ice Protection OFF

Fuel Boost Pumps OFF

NAV/GPS Selector NAV

The NAV/GPS selector is found on the pop-up switches panel only (Shift-5)

Flap Selector and Flap Position Agree

Visually confirm flap position agrees with the flap selector switch.

Battery and Alternator SwitchesON

Fuel Quantity Verify

Confirm fuel quantity indicated on gauges is sufficient for flight and record on navlog.

Fuel quantity must be above the minimum for takeoff. See [Limitations – Minimum Fuel Quantity for Takeoff](#).

Gear Position Lights 3 green

Flight Controls Check

Make slow and deliberate movements, one direction at a time. Confirmation of correct control operation may be observed either by:

- Observing the yoke in the Virtual Cockpit move in sync with control inputs, or:
- Observing the control surface animations move in sync with control inputs

Hold the control column full forward and the control wheel full left and:

- Confirm the VC yoke moves full forward and/or the elevators move full down
- Confirm the VC control wheel moves full left and/or the left aileron moves full up and the right aileron moves full down
- Confirm full and free movement of your hardware

Keeping the control wheel full left, move the control column full aft and:

- Confirm the VC yoke moves full aft and/or the elevators move full up
- Confirm the VC control wheel remains full left and/or the left aileron remains full up and the right aileron remains full down
- Confirm full and free movement of your hardware

Keeping the control column held full aft, rotate the control wheel fully right and:

- Confirm the VC control wheel moves full right and/or the right aileron moves full up and the left aileron moves full down
- Confirm the VC control column remains full aft and/or the elevators remain full up
- Confirm full and free movement of your hardware

Keeping the control wheel fully right, move the control wheel full forward and:

- Confirm the VC control wheel remains full right and/or the right aileron remains full up and the left aileron remains full down.
- Confirm the VC control column moves full forward and/or the elevators move full down
- Confirm full and free movement of your hardware

Relax the pressure on the control wheel and control column and:

- Confirm the controls return to centre both in the VC and on your hardware

Do not allow the control wheel and control column to spring back to centre. Relax the pressure and allow the control wheel and control column to return to centre in a smooth and controlled manner.

Call “RUDDER”.

Push the left rudder pedal to its full travel and:

- Confirm that the VC rudder pedals move full left and/or the rudder moves full left
- Confirm full and free movement of your hardware

Push the right rudder pedal to its full travel and:

- Confirm that the VC rudder pedals move full right and/or the rudder moves full right
- Confirm full and free movement of your hardware

Release the pedal and:

- Confirm that the pedals return to centre both in the VC and on your hardware

Do not allow the rudder pedals to spring back to centre. Relax the pressure and allow the pedals to return to centre in a smooth and controlled manner.

Call “FULL, FREE AND CORRECT”

Trims SET

Set the elevator trim approximately 1 unit nose up

Set the aileron and rudder trims to zero.

Departure Briefing.....Complete
Conduct departure briefing at a moment of appropriate workload.

The purpose of the departure briefing is for the crew to identify practical solutions to relevant threads whilst also ensuring a shared understanding of both normal and abnormal procedures and factors during takeoff and departure.

The briefing should cover:

Departure Briefing	
Threats	Highlight any relevant threats and how they will be avoided.
AIS	Review NOTAMs to assess the effect of promulgated airfield and nav-aid deficiencies.
Significant Weather	Review: <ul style="list-style-type: none"> - Wind direction and strength - Crosswind component - Temperature - Visibility - Precipitation - De/anti-ice requirements - Expected turbulence/windshear - Any other significant weather factors
Departure Alternate	Is a departure alternate required? If so, where?
Runway	Mention the departure runway and any pertinent details such as lighting, length etc.
Taxi Route	Review the expected taxi routing to the departure runway.
Transition Altitude	State
Terrain	Discuss proximate and enroute terrain problems as appropriate.
MSA	Review vs SID clearance
SID	Review expected clearance including profile and heights.
Radio Aids	Selected if required for the departure and correctly tuned and identified.
Emergencies	Review SOPs for rejected and continued take-off cases including the effect of wind direction, likely aircraft performance and other relevant factors.
Review	Review SOPs for normal operation, airfield delays and slot times, special considerations. Review pertinent points from briefing.

2.5 Engine Start Check

The usual start sequence is right, then left.

Navigation light switchON

Beacon light switchON

Mixtures Full RICH

Pitch Levers Full FINE

ATIS and Start Clearance..... Obtain

Once engine start clearance has been obtained:

Avionics OFF

Prevents damage to the avionics from electrical transients during engine start.

Propeller Area..... Clear

Throttle (right engine) Full OPEN

Fuel Boost Pump (right engine)HI

Wait for fuel flow indication to peak.

Fuel Boost Pump (right engine) OFF

Throttle (right engine)CLOSE then OPEN ½ inch

Magneto Switch (right engine) START, then BOTH

Release the magneto switch to BOTH once the engine starts.

Throttle..... Set 1,000 rpm

Oil Pressure Confirm minimum 10 psi within 30 seconds

Electrics28V and charging

Confirm that the battery is charging by observing a positive load on the ammeter.

START annunciator Extinguished

Repeat the above process for the left engine.

2.6 After Start Check

Commence the After Start Check once both engines are running.

AvionicsON

Radios..... Tune

Flight Instruments Set and Check

Confirm:

- The altimeter is set to the QNH and indicating airfield elevation and call “**QNH ____ SET, ____ FEET INDICATED, AIRFIELD ELEVATION ____ FEET.**”
- The HSI and magnetic compass agree and that the HEADING flag is not displayed and call “**HEADING __ CROSSCHECKED, NO FLAG**”

Engine Instruments.....Check

Scan the engine instruments and confirm:

- Oil temperature is above 24°C
- Oil pressure is in the green arc

CAUTION: Do not operate above 1,200 rpm until the above parameters are achieved.

External Lights As Required

Select the taxi light ON as required.

Fuel ValvesCROSSFEED

Position both fuel valves to the CROSSFEED position for taxi.

Confirms correct operation of the fuel crossfeed.

2.7 Taxi Check

WARNING: Taxi is a critical phase of flight and distractions and ‘head down’ time must be minimised during this period.

WARNING: Read and Do checklists may **ONLY** be completed with the aircraft stopped and the parking brake set. If an instructor or other competent pilot is occupying the right hand seat and expediency is required or desirable (e.g. to avoid an unacceptable delay to other airfield users) they may elect to carry out the checklist whilst the student taxis the aircraft or vice versa.

The Taxi Check is conducted by scan flow once taxi clearance has been received.

Taxi Area Clear
Visually confirm the area to the left and ahead of the aircraft is clear and call **“CLEAR LEFT”**

Visually confirm the area ahead and to the right of the aircraft is clear and call **“CLEAR RIGHT”**.

Note: When an instructor is seated in the right hand seat he or she shall visually clear the area ahead and to the right and call **“CLEAR RIGHT”**.

Brakes..... Check
Release the parking brake and smoothly apply power to commence the taxi. Only a small amount of power is required to break away.

As the aircraft starts to roll, smoothly apply both toe brakes and confirm correct braking action and that the pedals do not feel loose or spongy.

Flight Instruments Check
Confirm:

- The attitude indicator is erect and indicating wings level and pitch attitude level horizon and call **“HORIZON LEVEL”**
- In a turn to the left, that:
 - The turn co-ordinator wings dip to the left, the slip ball moves out to the right and the HSI and magnetic compass indications decrease and agree
 - Call **“WINGS LEFT, BALL RIGHT, DECREASING, DECREASING”**
- In a turn to the right, that:
 - The turn co-ordinator wings dip to the right, the slip ball moves out to the right and the HSI and magnetic compass indications increase and agree
 - Call **“WINGS RIGHT, BALL LEFT, INCREASING, INCREASING”**

2.8 Before Takeoff Check

WARNING: The aircraft must be stopped with the parking brake set before reading the Before Takeoff Check to the line.

Commence the Before Takeoff Check once the aircraft is stopped at the engine run-up area with the parking brake set.

Park BrakeON

CabinSecure

Confirm that all occupants are seated with hatches and harnesses secured.

Fuel Boost Pumps OFF

Engine Instruments Check

Confirm oil pressure is above 24°C and oil pressure is in the green arc.

Fuel Quantity Verify

Confirm quantity is sufficient for flight and in excess of 13 gallons per side.

Mixtures Full RICH

Fuel ValvesON

Start Annunciator OFF

Confirm the START annunciator lights are extinguished.

Throttles 2,200 rpm

Confirm engines accept increased power without hesitation.

Pitch Levers Check

Retard both pitch levers to drop of 200-300rpm and return to full fine.

Repeat this cycle three times on the aircraft's first flight of the day, or twice otherwise.

Throttles 1,700 rpm

Magnetos Check

One engine at a time:

- Select the magneto switch to L.
- Note the RPM.
- Verify that:
 - The RPM does not drop by more than 150 rpm
 - The engine does not stop
 - There is no rough running
- Return the magneto switch to BOTH and verify that the RPM returns to the previous value
- Select the magneto switch to R.
- Note the RPM.
- Verify that:
 - The RPM does not drop by more than 150 rpm
 - The engine does not stop
 - There is no rough running
 - There is no more than 50 rpm difference from the L magneto
- Return the magneto switch to BOTH and verify that the RPM returns to the previous value.

The checks may be characterised by the phrase “small drop, no stop, no rough running”.

Throttles 1,500 rpm
 Pitch LeversFeathering Check
 The feathering check is to be completed one engine at a time.

WARNING: A slow drop in RPM may indicate a faulty feathering mechanism.

CAUTION: Do not allow a drop of more than approximately 300 rpm whilst conducting the feathering check.

For each engine in turn:

- Retard the pitch lever to the feathering detent
- Observe a rapid drop in RPM
- Rapidly return the pitch lever to full fine before the rpm drops more than approx 300 rpm.

Note: Allowing a drop of greater than approximately 300 rpm may result in the propeller feathering fully. This can cause the engine to stall, resulting in damage to both the engine and the feathering mechanism.

Throttles IDLE, then 1,000 rpm
 Flaps UP
 Flight Controls..... Check
 Verify full, free and correct movement using the technique described in the Before Start Check and that there are no obstructions to the controls.

Make slow and deliberate movements, one direction at a time.

Call **“FULL, FREE AND CORRECT”**

Ice Protection..... As Required
 For flights in accordance with IFR, carry out a check of the ice protection systems in accordance with the [ICE PROTECTION SYSTEMS](#) Supplementary Procedures. Select the Pitot Heat ON.

Windows and Doors..... Locked Closed

Takeoff Briefing..... Runway/Intersection/SID/Extras
 The Departure Briefing may be updated once ATC departure clearance (Runway and SID/departure instructions) is obtained.

The acronym “RISE” may be used to recall the relevant items.

RUNWAY: Verbalise the RUNWAY from which departure has been cleared and the RWY designator with position relative to the aircraft.

INTERSECTION: Verbalise the INTERSECTION from which departure will take place.

SID: Verbalise the cleared SID or Departure Instructions, cross-checking the gross flight path (radio aids/CDI/HDG bug) and Stop Altitude (AP panel).

EXTRAS: Verbalise any other pertinent items, especially where these have changes since the departure briefing before start.

The following items are completed by memory when cleared to enter the runway.

Approach Check Clear
 Strobe LightON
 Landing LightON
 Transponder Mode C
 Confirm MODE C is selected and illuminating turquoise in vPilot by both instructor and student.

2.9 Takeoff Procedure

Runway Heading Confirm
 Verify the heading shown on the wet compass and the HSI agree with each other and the magnetic heading of the runway.

Announce **“RUNWAY ___, HSI ___ DEGREES, WET COMPASS ___ DEGREES”**

Takeoff Announce
 Throttles2,000 rpm
 Engine Instruments Check
 Momentarily hold the aircraft stationary on the brakes and verify:

- The power response is symmetrical and
- There is no hesitation, rough running or abnormal vibration
- Engine temperatures and pressures are in the acceptable range

Call **“T’S AND P’S IN THE GREEN”**

Brakes Release
 Throttles FULL
 Advance both throttles fully open, verify that the power increases to full and call **“POWER SET”**

Airspeed Indicator Check
 Verify that the airspeed increases and call **“AIRSPEED RISING”**

At 85 kt:

Rotation Initiate
 Smoothly raise the nose and allow the aircraft to fly itself off the runway. Do not yank the aircraft off the runway.

Airborne and with a positive rate of climb confirmed on both the VSI and altimeter:

Landing Gear Retract
 Establish a pitch attitude to maintain 105 kt to 500 ft aal or clear of obstacles, whichever greater.

At 500 ft aal or when clear of obstacles, whichever higher:

Pitch Levers2,500 rpm
 Select a pitch attitude to establish an enroute climb speed of 135 kt.

2.10 After Takeoff Check

Carry out the After Takeoff Check passing 1,000 ft aal.

Landing Gear UP
Confirm all lights extinguished.

Flaps UP

External Lights As Required
If departing the circuit, turn Landing and Taxi lights OFF.

Cowl Flaps CLOSE

2.11 Cruise Climb Check

Carry out the Cruise Climb check once the AFTER TAKEOFF check has been completed.

Pitch Levers 2,500 rpm

Throttles Full OPEN

Mixture As Required

Adjust the mixture as required to maintain peak power output

Engine Temperature Monitor

Fuel Boost Pumps As Required

2.12 Cruise Check

Carry out the Cruise Check when level at the initial cruising altitude.

Power Set
Set cruise power as desired.

The normal setting for training is 22" MAP and 2300 rpm.

Fuel Boost Pumps As Required

Mixture Lean using EGT

For extended cross-country cruise flight above 3,000 ft AMSL, lean to peak EGT and then enrichen by approximately 50°F.

Prop Sync As Required

2.13 Before Descent Check

Carry out the Before Descent check at least 5 minutes prior to top of descent (IFR) or 10-15 NM from the destination airfield (VFR).

Destination weather Obtain Briefing..... Complete

A descent and approach briefing should be made approximately 5 minutes before top of descent (IFR) or 10-15 NM from the destination airfield (VFR).

The acronym “TRAMDRAM” may be useful for recalling the information to be briefed.

Approach Briefing	
Type of Approach	State the type of approach that will be made (IFR) or join (VFR).
Runway in Use	State runway in use and any pertinent details such as length, width, lighting, displaced threshold etc.
Airfield	Highlight any airfield considerations and expected taxi routing
Minimum Safe Altitude	State the relevant MSA.
DA/MDA (IFR only)	Calculate applicable DA/MDA and state.
RVR Required (IFR only)	State RVR required to make the approach and compare to actual RVR.
Approach Ban (IFR only)	State whether an approach ban is in force.
Missed Approach (IFR only)	Briefly review missed approach procedure and rehearse actions.

Navigation Aids Tune

Minimum Safe Altitude Check

Fuel Check Quantity

Confirm quantity is sufficient for the approach and missed approach taking in to account required reserves. State available holding time.

Mixtures Full RICH

2.14 Initial Approach Check

Carry out the Initial Approach Check when beacon outbound or being vectored toward late downwind/base (IFR) or prior to joining the circuit (VFR).

Taxi Light ON
 Landing Light ON
 Prop Sync OFF
 Mixtures Full RICH
 Pitch Levers Full FINE
 Radios Tuned and Identified
 Altimeter Set and Checked
 Approach/Minimum State
 Cabin Secure
 Ensure all occupants are seated with seatbelts fastened and that all doors, hatches and loose articles are secured.

2.15 Landing Check

Carry out the Landing Check at half-scale GS deflection or 1 NM prior to the FAF (IFR) or abeam the landing threshold (VFR).

Brakes OFF
 Landing Gear DOWN, 3 green
 Flaps APH
 Mixtures Full RICH
 Pitch Levers Full FINE

2.16 Final Check

Carry out the Final Check prior to 1,000 ft aal.

Pitch Levers Full FINE
 Landing Gear DOWN, 3 green
 Flaps As Required
 Full flap must be selected prior to 200ft aal

2.17 Missed Approach Procedure

Throttles FULL
Smoothly increase to full power and select a pitch attitude to maintain 105 kt

FlapsRetract one stage

Landing Gear Retract
Verify a positive rate of climb on the altimeter and VSI before retracting the landing gear.

Flaps UP if required
If full flap had been selected prior to the missed approach, retract the remaining flap.

Passing 1,000 ft aal, do the [AFTER TAKEOFF](#) check.

2.18 After Landing Check

WARNING: Taxi is a critical phase of flight. Head-down time and distractions must be minimised during this time.

WARNING: Read and Do checklists may ONLY be completed with the aircraft stopped and the parking brake set. If an instructor is occupying the right hand seat and expediency is required or desirable (e.g. to avoid an unacceptable delay to other airfield users) they may elect to carry out the checklist whilst the student taxis the aircraft or vice versa.

Carry out the After Landing Check once clear of the active runway.

Flaps UP

Landing Light OFF

Strobe Light OFF

Ice Protection OFF
Select pitot heat and electrothermal propeller deice OFF.

Transponder STANDBY

Cowl Flaps OPEN

Fuel Boost Pumps As Required
Select the Fuel Boost Pumps to LO if OAT is 32°C or above.

Trims Set to Zero

2.19 Shutdown Check

Park BrakeON
 Pitch Levers Full FINE
 Throttles 1,000 rpm
 Fuel Boost Pumps OFF
 Avionics OFF
 Throttles 1,700 rpm
 Magnetos Check
 One engine at a time:

- Select the magneto switch to L.
- Note the RPM.
- Verify that:
 - The RPM does not drop by more than 150 rpm (“small drop”)
 - The engine does not stop (“no stop”)
 - There is no rough running (“no rough running”)
- Return the magneto switch to BOTH and verify that the RPM returns to the previous value
- Select the magneto switch to R.
- Note the RPM.
- Verify that:
 - The RPM does not drop by more than 150 rpm
 - The engine does not stop
 - There is no rough running
 - There is no more than 50 rpm difference from the L magneto
- Return the magneto switch to BOTH and verify that the RPM returns to the previous value.

The checks may be characterised by the phrase “small drop, no stop, no rough running”.

Throttles IDLE, then 1,000 rpm
 Mixtures Idle Cut-off
 Magnetos (both) OFF
 Alternators OFF
 Battery switch OFF
 Flight Controls Locked
 Merlin PIREP Check Filed
 Confirm that the Merlin DEBRIEFING screen is available and the Pirep has been sent.

If the aircraft is to be parked for an extended period, ensure the wheels are chocked and park brake released.

2.20 Standard Callouts

2.20.1 General

Standard phraseology is essential to ensure effective crew communication. Phraseology should be concise and exact. This section lists the callouts that should be used as standard. They supplement the callouts identified in the Normal Procedures above.

2.20.2 Checklist Callouts

“CHECK” – a request for a second pilot to check an item

“CHECKED” – to indicate that an item has been checked

“CROSSCHECKED” – A callout verifying information from two or more sources (e.g. the HSI and wet compass)

If a checklist needs to be interrupted, announce **“HOLDING CHECKLIST AT ____”** and **“RESUMING CHECKLIST AT ____”** for the continuation.

Upon completion of a checklist, announce **“__ CHECK COMPLETE”**.

2.20.3 Autoflight Related Callouts

2.20.3.1 General

All actions performed on the autopilot control panel should be confirmed on the autopilot mode annunciator (left hand side of the autopilot LCD).

2.20.3.2 AP/FD Mode Engagement

All modes engaged on the AFDS should be confirmed on the annunciator and called out, e.g.

“AUTOPILOT ON/OFF”

“FLIGHT DIRECTOR ON/OFF”

“HEADING”

“NAV”

“ALT HOLD”

“VERTICAL SPEED”

2.20.3.3 Armed

Modes which are armed but not yet active should be called out using the **“ARMED”** phase, e.g.:

“NAV ARMED”

“ALT ____ FEET ARMED”

2.20.4 Radio Navigation Settings

PF shall verbalise all nav aids identified, e.g.

“__(NDB identifier) **IDENTIFIED ON ADF**”

“__(VOR or ILS identifier) **IDENTIFIED ON NAV __, TRACK SET __ DEGREES**”

2.20.5 Transfer of Controls

When taking or assuming control, crew members are required to use the following callouts:

2.20.5.1 Giving Control

The pilot flying calls out **“YOU HAVE CONTROL”**. The other pilot accepts this transfer by calling out **“I HAVE CONTROL”** on assuming PF duties.

2.20.5.2 Taking Control

The pilot taking control calls out **“I HAVE CONTROL”**. The other pilot acknowledges this transfer by callout out **“YOU HAVE CONTROL”** and relinquishes the controls.

2.20.6 Flap and Gear Callouts

2.20.6.1 Flap Callouts

PF shall check the speed is below the relevant limit and verbalise the relevant limit speed before any change in flap setting, e.g.:

“SPEED BELOW 152 KNOTS, FLAPS APPROACH”

“SPEED BELOW 122 KNOTS, FLAPS FULL”

Once the selection has been made, the PF will verify that the flaps have extended to the selected setting and the relevant light is illuminated and call:

“FLAPS APPROACH SET, BLUE LIGHT”

“FLAPS FULL SET, AMBER LIGHT”

“FLAPS UP, LIGHTS OUT”

2.20.6.2 Landing Gear Extension

PF shall check the speed is below V_{LO}/V_{LE} and verbalise the limit speed before making any gear selection, e.g.:

“SPEED BELOW 152 KNOTS, GEAR DOWN”

Once the gear has been extended, PF shall verify that all three green lights are illuminated and call:

“GEAR DOWN, THREE GREEN”

2.20.6.3 Landing Gear Retraction

Prior to retracting the landing gear, PF shall verify a positive rate of climb on the VSI and altimeter.

“POSTIVE RATE, GEAR UP”

Once the landing gear has retracted, PF shall verify that all three gear lights are extinguished and call:

“GEAR UP, LIGHTS OUT”

2.20.7 Summary for Each Phase

2.20.7.1 Before Engine Start

EVENT	STANDARD CALL
Commencing initial preparation	BEFORE START CHECK
Flight Control Check complete	FULL, FREE AND CORRECT
Once departure briefing completed	BEFORE START CHECK COMPLETE

2.20.7.2 Engine Start

EVENT	STANDARD CALL
When ready to start engines	ENGINE START CHECK DOWN TO THE LINE
When ATC start clearance received	BELOW THE LINE
Prior to selecting each magneto/start switch to START	CLEAR PROP
When both engines are started	ENGINE START CHECK COMPLETE

2.20.7.3 After Engine Start

EVENT	STANDARD CALL
Once both engines are started	AFTER START CHECK
Flight Instrument Check:	
1. Altimeter	QNH ___ SET, ___ FEET INDICATED, AIRFIELD ELEVATION ___ FEET
2. HSI and magnetic compass	HEADING ___ CROSSCHECKED, NO FLAG
When all checks completed and before taxi clearance received	AFTER START CHECK COMPLETE

2.20.7.4 Taxiing

EVENT	STANDARD CALL
Once taxi clearance received	BRAKES RELEASED
When moving away	BRAKE CHECK
Flight Instrument Check: 1. Artificial Horizon	HORIZON LEVEL
2. Turn and Slip Indicator	WINGS LEFT, BALL RIGHT, DECREASING, DECREASING WINGS RIGHT, BALL LEFT, INCREASING, INCREASING

2.20.7.5 Before Takeoff

EVENT	STANDARD CALL
At the runway holding or engine run-up position	BEFORE TAKEOFF CHECK DOWN TO THE LINE
Magneto check: 1. Right engine	RIGHT ENGINE LEFT ___ RPM DROP BOTH RIGHT ___ RPM DROP BOTH MAGS CHECKED LESS THAN 150, NO MORE THAN 50 DIFFERENCE
2. Left engine	LEFT ENGINE LEFT ___ RPM DROP BOTH RIGHT ___ RPM DROP BOTH MAGS CHECKED LESS THAN 150, NO MORE THAN 50 DIFFERENCE
Flight control check completed	FULL, FREE AND CORRECT
Line up clearance received	BELOW THE LINE
After final items completed	BEFORE TAKEOFF CHECK COMPLETE

2.20.7.6 Takeoff

EVENT	STANDARD CALL
When lined up	RUNWAY ____, HSI ____, DEGREES, WET COMPASS ____, DEGREES
Before increasing power	TAKEOFF
When power is set to 2,000 RPM and engine indications are satisfactory	T'S AND P'S IN THE GREEN BRAKES RELEASED
When full power is set	POWER SET
ASI needle increasing	AIRSPEED RISING
At 85 kt	85 KNOTS, ROTATE

2.20.7.7 Rejected Takeoff

EVENT	STANDARD CALL
Decision to abandon takeoff	STOP

2.20.7.8 After Takeoff

EVENT	STANDARD CALL
Gear retraction	POSITIVE RATE GEAR UP
When landing gear retraction complete	GEAR UP, LIGHTS OUT
Passing 1,000 ft aal	AFTER TAKEOFF CHECK
All After Takeoff items completed	AFTER TAKEOFF CHECK COMPLETE

2.20.7.9 Climb and Descent

EVENT	STANDARD CALL
Altimeter setting change	STANDARD or ____, SET AND CHECKED
Cleared above MSA	CLEARANCE ABOVE MSA OF ____, FEET
Cleared below MSA	CLEARANCE BELOW MSA OF ____, FEET
Climb/descent clearance (IFR) or change of target altitude (VFR)	____ FEET (or FL ____) CLIMBING/DESCENDING ____ FEET (or FL ____), QNH ____, SET (or STANDARD SET)
200 ft to cleared altitude	200 FEET TO GO
At least 5 minutes prior to top of descent (IFR) or 10-15 NM from arrival airfield (VFR)	BEFORE DESCENT CHECK
Before Descent checklist items completed	BEFORE DESCENT CHECK COMPLETE

2.20.7.10 Approach

EVENT	STANDARD CALL
Initial Approach checklist	INITIAL APPROACH CHECK INITIAL APPROACH CHECK COMPLETE
Landing checklist	LANDING CHECK LANDING CHECK COMPLETE
At glideslope interception or below GA altitude for NPA (IFR)	MISSED APPROACH ALTITUDE ____ FEET CHECKED
At FAF	FINAL APPROACH FIX, ALTITUDE CHECKED
Having performed glideslope check	GLIDESLOPE CHECKED
Prior to 1,000 ft aal	FINAL CHECK FINAL CHECK COMPLETE

2.20.7.11 Landing

EVENT	STANDARD CALL
Visual reference achieved	VISUAL
At 200 ft aal and STABLE	STABLE
At 200 ft aal and NOT STABLE	UNSTABLE, GOING AROUND
DA/MDA no visual reference	MINIMUMS, GOING AROUND*
DA/MDA visual reference	MINIMUMS, CONTINUING*

*DA/MDA related callouts may be omitted once "VISUAL" has been called

2.20.7.12 Missed Approach

EVENT	STANDARD CALL
GO AROUND decision	GOING AROUND
Flap retraction	SPEED BELOW ____ KNOTS, FLAPS ____ FLAPS ____ SET, ____ LIGHT/LIGHTS OUT
Gear retraction	POSITIVE RATE GEAR UP
Gear retraction complete	GEAR UP, LIGHTS OUT
Passing 1,000 ft aal	AFTER TAKEOFF CHECK AFTER TAKEOFF CHECK COMPLETE

2.20.7.13 After Landing

EVENT	STANDARD CALL
When clear of active runway and parking brake set	AFTER LANDING CHECK AFTER LANDING CHECK COMPLETE

2.20.7.14 Shutdown

EVENT	STANDARD CALL
When parked in final position and parking brake set	SHUTDOWN CHECK
Magneto check: 1. Right engine	RIGHT ENGINE LEFT ___ RPM DROP BOTH RIGHT ___ RPM DROP BOTH MAGS CHECKED LESS THAN 150, NO MORE THAN 50 DIFFERENCE
2. Left engine	LEFT ENGINE LEFT ___ RPM DROP BOTH RIGHT ___ RPM DROP BOTH MAGS CHECKED LESS THAN 150, NO MORE THAN 50 DIFFERENCE
All shutdown checklist items complete	SHUTDOWN CHECK COMPLETE

3 Supplementary Procedures

3.1 Introduction

3.1.1 General

This chapter contains procedures (external power start, adverse weather operation and so on) accomplished as required rather than routinely performed on each flight.

Procedures accomplished in flight, or those that are an alternate means of accomplishing normal procedures (such as icing selections) are usually accomplished by recall. Infrequently used procedures (such as an external power start) are usually accomplished by reference.

3.2 Cold Weather Operation

3.2.1 Definition of Icing Conditions

Icing conditions are considered to exist any time the OAT is +5°C and below **and** there is visible moisture present.

3.2.2 General

3.2.2.1 Preflight Inspection

Verify that the tires are not frozen to the ramp, and that the brakes are free of ice contamination. Deicing or anti-icing solutions may be used on the tires and brakes if they are frozen. Solutions which contain a lubricant, such as oil, must not be used as they will decrease the effectiveness of the brakes. In addition to the normal exterior preflight inspection, special attention should be given all vents, openings, static ports, control surfaces, hinge points, the stall warning vane, the windshield, and the wing, tail, and fuselage surfaces for accumulations of ice or snow. Removal of these accumulations is necessary prior to takeoff. The removal of frozen deposits by chipping or scraping is not recommended. A soft brush, squeegee, or mop may be used to clear snow that is not adhering to the surfaces. Airfoil contours may be altered by the ice and snow to the extent that their lift qualities will be seriously impaired. Ice and snow on the fuselage can increase drag and weight. Frost that may accumulate on the wing, the tail surfaces, or on any control surface, must be removed prior to flight.

Conditions for accumulating moisture in the fuel tanks are most favourable at low temperatures due to the condensation increase and the moisture that enters as the system is serviced. Therefore, close attention to draining the fuel system will assume particular importance during cold weather.

Always pull the propeller through by hand, opposite the direction of rotation several times to clear the engine and "limber up" the cold, heavy oil before using the starter. This will also lessen the load on the battery if external power is not used.

Under very cold conditions, it may be necessary to preheat the engines prior to a start. Particular attention should be given to the oil cooler, engine sump and propeller hub to ensure proper preheat. A start with congealed oil in the system may produce an indication of normal pressure immediately after the start, but then the oil pressure may decrease when residual oil in the engine is pumped back with the congealed oil in the sump. If an engine heater capable of heating both the engine sump and cooler is not available, the oil should be drained while the engine is hot and stored in a warm area until the next flight.

3.2.2.2 After Starting

If there is no oil pressure within the first 30 seconds of running, or if oil pressure drops after a few minutes of ground operation:

- Shut down the engines
- Check for broken oil lines, oil cooler leaks or congealed oil.

Note: It is advisable to use external power for starting in cold weather.

During warm-up monitor engine temperature closely since it is possible to exceed the cylinder head temperature limit in trying to bring up the oil temperature.

3.2.2.3 Taxiing

Avoid taxiing through water, slush or muddy surfaces if possible.

In cold weather, water, slush or mud splashed on to landing gear mechanisms or control surface hinges may freeze, preventing free movement and resulting in structural damage.

3.2.2.4 Before Takeoff

During run-up, exercise the propellers a minimum of three times to remove cold oil from the pitch change mechanism.

After completion of the Before Takeoff checklist, verify that the aeroplane is still free of frozen contaminants.

Ensure the runway is free from hazards such as snow drifts, glazed ice and ruts.

3.2.2.5 Takeoff

Allow additional take-off distance when snow or slush is on the runway.

Extra cycling of the landing gear when above 500 ft AGL may help clear any contamination from the gear system.

3.2.2.6 Descent

During descent and landing give special attention to engine temperatures, since the engines will have a tendency toward overcooling.

3.2.2.7 Landing

Braking and steering are less effective on slick runways. Also, hydroplaning may occur under wet runway conditions at higher speeds. Use the rudder to maintain directional control until the tyres make solid contact with the runway surface.

3.3 Ice Protection Systems

3.3.1 Before Takeoff

For all IFR flights the ice protection systems must be tested prior to departure according to the following procedures.

3.3.1.1 Surface De-Ice System Test

Right Throttle 2,000 rpm

Surface Deice ON

Check for 15 psi minimum deice pressure

Surface Deice OFF

Right Throttle IDLE

Repeat with left throttle.

3.3.1.2 Electrothermal Propeller Deice Test

Propeller Deice ON

Propeller Deice Ammeter CHECK

Confirm 14 to 18 Amps

Propeller Deice OFF

Select the propeller deice OFF if not required for takeoff.

3.3.1.3 Pitot Heat Test

Either alternator OFF

Pitot Heat Cycle on and off

Note needle deflection on operating alternator's loadmeter.

Both alternators ON

Pitot Heat ON if takeoff conditions require

3.3.2 In Flight

WARNING: Minimum airspeed for flight in icing conditions is 130 KIAS. This applies to all phases of flight except takeoff and landing. If airspeed is decreasing due to ice accumulation, and power or altitude changes fail to curtail airspeed deceleration, alter flight to exit icing conditions before speeds of less than 130 KIAS are reached.

CAUTION: Flight in icing conditions may eventually cause the cowling inlets to become partially blocked, resulting in higher cylinder head temperatures. If cowl flaps are required to keep cylinder head temperatures below the red line, the flight should be altered to exit icing conditions as soon as possible.

3.3.2.1 When Entering Icing Conditions:

Propeller DeiceON
Pitot Heat Confirm ON

3.3.2.2 When ¼” of Ice Forms on Wings:

Surface Deice OPERATE

3.3.2.3 If more than ½” of Ice Forms on Wings:

Autopilot Monitor
Consider a change of altitude/level to leave icing conditions.

3.3.2.4 On leaving icing conditions:

Propeller Deice OFF

3.3.3 After Landing

Pitot Heat OFF
Propeller Deice OFF

3.4 Engines

3.4.1 External Power Start

Battery switch	OFF
Alternators (both)	OFF
Electrical Equipment	OFF
Avionics	OFF
External Power Unit	Connect
Battery switch	ON
External Power Unit	on
Right Engine	Start
Use normal start procedure	
External Power Unit	OFF
Turn the external power unit off once the right engine is running.	
External Power Unit	Disconnect
Disconnect the external power unit before starting the left engine.	
Alternators (both)	ON
Verify right loadmeter indicates positive load.	
Left Engine	Start
Use normal start procedure.	
Loadmeters	Check
Verify both loadmeters indicate positive load.	

4 Procedures & Techniques

4.1 Introduction

The purpose of this section is to highlight the basic procedures to be followed during BAVirtual operations. While there may be several techniques to carry out a specific task, this section defines the standard technique during BAVirtual operations.

4.2 Basic Principles

4.2.1 Attitude Flying

Selection and maintenance of the correct attitude during flight is fundamental to flight. Whether conducting visual flight or using instruments, the following cycle should always be used:

SELECT	the required attitude
HOLD	that attitude
TRIM	out any control forces when not in a turn

The aircraft must be allowed to settle down in order to observe the effects of the new attitude.

4.2.2 Power Selection

Good engine handling must be maintained throughout the duration of the flight. Excessive manifold pressure for a given RPM is a common way that an engine is overstressed. Appropriate mixture control must be accomplished to minimise excessive fuel consumption but also avoid lean cutting the engines.

For significant changes to engine power, the mixture may need to be adjusted also. In general, when increasing power the engine levers should be moved from right to left; to decrease power the engine levers should be moved left to right.

4.2.3 Attitude and Power Changes

When changing attitude requires a change of power, you should:

Power	Reselect
Attitude	Hold
Trim	Adjust

When accelerating after levelling off from a climb, the power is left set at climb power until approaching the desired speed where it is then reduced. The method then becomes:

Attitude	Hold
Power	Reselect
Trim	Adjust

4.3 Departure

4.3.1 VFR Departure

- Climb straight ahead to 500 ft AAL.
- Perform a lookout and then turn perpendicular to the runway to depart on the crosswind leg, whilst maintaining a climb.
- Departures on the downwind or base legs are also permissible by joining the visual circuit then departing with ATC permission.
- Once clear of the visual circuit, set a course to the first leg of your route, whilst remaining clear of any potential conflict with other aircraft operating in the aerodrome circuit.
- Be aware of any noise abatement procedures applicable to the aerodrome you are operating from. These procedures supersede this document.

4.3.2 IFR Departure

- Any instructions given by ATC must be adhered to. This may be in the form of a Standard Instrument Arrival (SID) or a departure instruction.
- Identification of appropriate navigational aids should be actioned as soon as practical after departure.

4.4 Enroute

4.4.1 VFR Navigation

4.4.1.1 Error Correction

The method used for correcting track error is the Double Track Error. If, along a leg, it is determined that the aircraft is off track, an adjustment must be made to re-join the correct track. The method to achieve this depends on whether you are past the Point of Equal Time (PET) of the leg.

Before the PET:

- Calculate the angle you are off track by
- Double this angle and turn that number of degrees in the direction of the desired track
- Maintain this heading for the number of minutes of the leg flown
- After this time, revert to the original wind corrected heading to maintain the original planned track.

After the PET:

- Turn by the number of degrees you are in error to reach the endpoint of the leg.

4.4.1.2 Turning Points

A good acronym to remember the actions at a turning point is HAAT:

- Heading: the heading to be turned to in order to track to the next turning point.
- Altitude: the altitude to be flown to keep in line with the semi-circular rule (or to avoid airspace).
- Airspeed: the indicated airspeed to be flown for the leg.
- Time: the time the leg will take.

The acronym should be used three times through a leg: a few minutes before turning (pre-HAAT), when turning (HAAT) and after the turn (post-HAAT). Each time, it is to verbalise and confirm the actions being taken at the turning point.

4.4.1.3 Diversion

During the VFR navigation exercises, the P2/P3 skills test and MEP check, you will be asked to carry out a VFR diversion. The instructor/examiner will tell you a point to divert to (and point to its position on a chart if you are unfamiliar) and then ask you to execute the diversion. If you are aware of your present position, you can initiate a dead-reckoning heading to the point while calculating the exact heading. Should you be unfamiliar with your precise location, navigate to a familiar point and execute from the new point. It is important to remember that the student is expected to carry out the diversion expeditiously and without unnecessary delay.

During this exercise, it is important to use a chart to calculate the appropriate heading to fly and to remain aware of airspace. The student remains responsible for the correct operations with regards to controlled airspace.

Once all necessary calculations have been made, the student should inform the instructor/examiner of the heading to be flown, the altitude the aircraft will be flown at and the duration of the leg to the diversion point. For this reason, it is advised to carry out a HAAT once established on an appropriate heading.

4.4.2 IFR Navigation

4.4.2.1 Radio Aids

Navigational aids should not be used while operating outside of their Designated Operational Coverage (DOC). Any beacon that is used must be identified beforehand.

4.4.2.2 Flight Management

For safe and expeditious operations, ensuring the aircraft is set up for the correct phase of flight is of paramount importance. Given the nature of single pilot operations, maintaining good management of the cockpit mitigates overloading of the pilot. A few helpful techniques to achieve this:

- Maintain a 'use and replace' technique for frequencies. Once two way communication has been established, replace the old frequency with the next frequency required. This is also used for navigational aids.
- Take note of any clearances provided by ATC. This mitigates the chance of the clearance being forgotten if you get distracted. This can also be extended to altitude changes/headings/frequencies etc.
- Using similar methods to VFR navigation with regards to turning points ensures consistency with your flying and navigation log management.

4.4.3 Stalls

4.4.3.1 Pre-stall checks

Before actioning a stall, a HASELL check must be performed to ensure the aircraft is in the correct configuration to perform a stall safely. For VFR flight, the student is responsible for all aspects of the HASELL check. If the stall is carried out in actual or simulated IMC, the responsibility for the location and lookout falls to the instructor or examiner, as does radio and further navigation. The student may be instructed to position the aircraft in such a way to aid the instructor/examiner.

4.4.3.2 Stall Recovery

The standard method to recover from the stall is to:

- Apply forward pressure to the control column until the symptoms of the stall cease.
- Apply full power to both engines.
- In case of any yaw or wing drop, prevent this with rudder not aileron to prevent further stall.
- Once stall indications cease, roll wings level with ailerons.
- Commence a climb.

Clean Stall:

A clean stall is only required to be demonstrated as part of VFR flight training (P2/3 and MEP check). This is executed as follows:

- Complete HASELL check.
- Close both throttles.
- Gradually increase pitch to maintain altitude.
- At the first indication of the stall, execute the standard stall recovery.

Base to final stall:

For the VFR training, the base to final stall is completed visually. For the latter stages of the P5 course, the base to final stall is executed using instruments. This is executed as follows:

- Complete HASELL check while maintaining altitude. As part of the Airframe section the aircraft will be configured to gear down and flaps APH.
- Reduce throttles to 13"-14" MAP.
- While maintaining altitude, as speed passes through 100 KIAS, roll on 20-30 degrees of bank.
- Increase pitch to maintain altitude while keeping the same angle of bank.
- At the first indication of the stall, carry out the standard stall recovery.
- Once safely climbing away, raise flap and gear in line with the normal Go Around procedure.

Final approach stall:

As with the base to final stall, the final approach stall is conducted visually for P2/3 and MEP check and on instruments for the latter stages of the P5 course. This is executed as follows:

- Complete HASELL check while maintaining altitude. As part of the Airframe section the aircraft will be configured to gear down and flaps APH.
- A simulated turn from base to final will be executed. Once rolling out of the turn, set the flaps to DN.

- Reduce power to 13"-14" MAP and maintain level flight (or a slight descent) by increasing pitch.
- At the first indication of the stall, carry out the standard stall recovery.
- Once safely climbing away, raise flap and gear in line with the normal Go Around procedure.

4.5 Approach and Landing

4.5.1 Holds

The basic hold technique is:

- Outbound timing is 60 seconds \pm 1 second per 1 knot headwind/tailwind.
- Drift correction on the outbound leg is 3x single drift. If this heading is within 30° of the wind direction, adopt 2x single drift.
- The GATE is defined as a QDM which is 30° from the hold axis. This gate, in relation to the aircraft position, is for guidance only.
- When within 60° on the inbound turn of the hold, you should be 10° off the inbound QDM. When flying an approach using a NDB, this may show as 'on' the QDM due to the associated dip error.

4.5.2 Hold Entry

4.5.2.1 Sector 1 – Parallel

- Start the timer when overhead the beacon/fix.
- Fly outbound for 60 seconds \pm 1 second per 1 knot headwind/tailwind.
- Use 1x drift outbound and 1x drift inbound.
- The inbound leg should be modified to intercept the hold QDM before passing over the beacon/fix.

4.5.2.2 Sector 2 – Offset

- Start the timer when overhead the beacon/fix.
- Fly a heading in order to maintain a track which is 30° from the hold axis on the holding side.
- Fly outbound for 60 seconds \pm 1 second per 1 knot headwind/tailwind.
- Use 1x drift outbound and 1x drift inbound.

4.5.2.3 Sector 3 – Direct

- If within 30° of the hold axis, operate as a normal hold (See 4.5.1).
- If joining from the non-holding side outside of 30°, when overhead turn to fly at 90° to the hold axis for 15 seconds before turning into the hold. Start the timer for downwind when wings level.
- If joining from the holding side fly to the beacon/fix. Maintain the current heading for 10-15 seconds (wind dependent) before turning to cross the hold axis at 90°. Once abeam, start the timer. After 15 seconds turn onto the outbound leg of the hold and restart the timer when back abeam or wings level, whichever occurs later.

4.5.3 IFR Approaches – General

All IFR approaches follow a structure of five segments.

4.5.3.1 Arrival Route/Segment

The arrival segment begins when the aircraft leaves the enroute airways system to begin its arrival to an airfield. This is often in the form of a Standard Arrival Route (STAR).

4.5.3.2 Initial Segment

It is during the initial segment that the aircraft is directed to a point to intercept the intermediate segment. The initial segment starts at the Initial Approach Fix (IAF) and ends at the Intermediate Fix (IF).

Irrespective of the method published, it is during this segment that the Initial Approach checks are to be performed.

4.5.3.3 Intermediate Segment

The intermediate segment is used usually to slow down the aircraft and configure. For the purpose of BAVirtual operations, this is actioned in the Initial Segment. Descent in the intermediate segment is kept to a minimum. This segment starts at the IF and ends at the Final Approach Fix (FAF)/Track (FAT).

For a non-precision approach, landing checks are to be completed 1NM before the FAF, or 15 seconds before establishing on the final approach track when the approach is flown using time.

For a precision approach, landing checks are to be completed when the glideslope indicator shows half-scale fly up.

4.5.3.4 Final Segment

The final segment is when the aircraft commences its descent to land. During this segment, it is imperative that the FAT is maintained using the published approach aid while the aircraft descends. By 1000' AGL on the final approach the final checks must be completed.

4.5.3.5 Missed Approach Segment

The missed approach segment begins either at the missed approach point (MAPt) for a non-precision approach or at the decision altitude (DA) for a precision approach. It is during this phase that the aircraft climbs away from the ground to achieve a safe altitude from terrain, allowing reposition for another attempt at the approach. It is during this segment that the After Take-off checks are to be performed again.

4.5.4 IFR – Non-Precision Approach

A non-precision approach is defined as an instrument approach which utilises lateral guidance but does not utilise vertical guidance. The accuracy of lateral guidance depends on the approach aid being used and is reflected in the published minima for the approach.

Non-precision approaches can either be flown procedurally or, if able, radar vectored to the final approach track. DME is required for some approaches which will be stated on the approach plate.

4.5.4.1 Flying a Non-Precision Approach

The following provides guidance on how to fly a non-precision approach:

- An VOR or NDB should be re-identified when outbound on the procedure if it is the primary navigation aid used during the final approach segment. If a localiser is to

be used, it should be re-identified within 30° of the inbound QDM and within 17 DME.

- With 60° remaining in the turn on the base leg, you should observe an indication of 5° from the inbound QDM ignoring dip error.
- In order to be established on the final approach track, the aircraft must show indications within 5° of the inbound QDM. Descent must not be commenced until within this tolerance. If, during descent, the aircraft moves outside of this tolerance the descent must be stopped. Once tracking is back within limits, a descent may be recommenced. If it is not possible to get tracking back within limits, a go around must be initiated.
- A go around must be initiated if, at Minimum Descent Altitude (MDA), the required visual references are not achieved.

4.6 Asymmetric Operations

4.6.1 Engine Failure

It is imperative that, following an engine failure, as much drag is removed as possible. A wind-milling propeller causes a significant amount of drag, so the propeller of the engine suffering the failure should be feathered as soon as possible. The actions to carry out after an engine failure are:

- Prevent yaw with rudder. It is vital to maintain directional control following an engine failure, while maintaining a bank of no greater than 3 degrees. Maintain V_{YSE} (100 KIAS).
- Carry out the appropriate engine failure checklist, while maintaining V_{YSE} .

Should it not be possible to maintain level flight following an engine failure, a forced landing should be executed. Apply gear and flaps as appropriate, considering the increase in drag when extended.

If an engine failure is being simulated, all drills after 'Landing Gear... UP' are to be touch drills only, with the student verbalising what would be done to the instructor/examiner. The instructor/examiner will then remain in control of the simulated inoperative engine until such a time that control is handed back to the student.

4.6.2 Cruise

Once at a stable cruising altitude, accelerate the aircraft to the asymmetric cruising speed of 145 KIAS. When approaching approximately 5 knots before this speed, reduce the power on the operating engine to 25" MAP and reduce propeller to 2500 RPM. Adjust the power setting after this to maintain 145 KIAS. Adjust the mixtures as normal and consider crossfeeding fuel as fuel is burnt in the selected tank.

4.6.3 Visual circuit

The track for a visual circuit should be flown in the same way as an All Engine Operating circuit, however do not allow the speed to drop below V_{YSE} until committed to landing below Asymmetric Committal Altitude (ACA). The ACA used at BAVirtual is 200' AGL. In order to continue past ACA, the following criteria must be met:

- Stable approach criteria met.
- Runway is clear.
- Landing clearance received. If a 'land after' instruction has been passed, the preceding aircraft must have vacated the runway by ACA.

If the engine failure is 'simulated' the instructor/examiner may permit the student to continue past ACA if ACA criteria has not been met. Any go-around initiated below ACA must be executed using both engines. The student should always assume a go around if ACA is not met unless explicitly stated to continue by the instructor/examiner.

4.6.4 Instrument approach

An asymmetric instrument approach is flown similarly to an All Engine Operating instrument approach. If the required minima are not obtained by DA/MDA/ACA, an asymmetric go around must be executed. Should visual conditions be obtained before ACA, the latter stages of the approach are now the same as for a visual circuit.

4.6.5 Go around

- Apply full power on the live engine, while preventing the yaw with rudder.
- If the speed is below V_{YSE} then maintain the present attitude until the speed reaches V_{YSE} .
- If the speed is at V_{YSE} , maintain this speed by adjusting the attitude.
- If the speed is above V_{YSE} , increase the pitch then adjust to maintain V_{YSE} .
- Follow the standard go-around procedure to remove gear and flaps, while maintaining V_{YSE} .
- Once at the required altitude, reduce power to maintain the required asymmetric cruise speed.

5 Systems

5.1 Flight Controls

5.1.1 Control Surfaces

The control surfaces are bearing-supporting and operated through a system of push-pull rods and conventional chain/cable systems terminating in bellcranks.

5.1.2 Control Columns

The aircraft is equipped with dual control columns for pilot and co-pilot. The control wheels are interconnected and provide aileron and elevator control.

5.1.3 Trim Controls

Trim tabs are installed on the rudder and elevator. The left aileron is fitted with a combined trim/servo tab.

The tabs are adjusted using the trim controls mounted on the centre console. The trim controls are linked to the tabs using closed cable systems.

Mechanical position indicators for each of the trim tabs are integrated with their respective controls.



Rudder and aileron trim controls and indicators (left) and elevator trim control and indicator (right)

5.2 Instrument Panel

5.2.1 Flight Instruments

The flight instruments are located on a panel directly in front of the pilot's seat. The aircraft is fitted with a standard set of analogue flight instruments including:

- A vacuum-powered attitude indicator **(12)**
- A vacuum-powered Horizontal Situation Indicator **(15)**
- A DC electric powered turn indicator **(14)**
- Airspeed indicator **(11)**
- Three-pointer altimeter with hPa subscale **(13)**
- Vertical Speed Indicator **(16)**

A magnetic compass **(23)** is mounted above the instrument panel and an outside air temperature indicator is available via 2D pop-up panel through the key combination Shift-8.

5.2.2 Engine Instruments

Most of the engine instruments are located in two columns on the centre instrument panel. Each column provides gauges for its respective engine.



At the top are the engine manifold pressure gauges **(1)** followed by the tachometers **(2)** and fuel flow gauges **(3)**. Below these are four multiple-readout gauges: cylinder head and exhaust gas temperature (CHT/EGT) **(4)** and oil temperature and pressure **(5)**. The left and right loadmeters (not visible in this image), bus voltmeter (not visible in this image) and left and right fuel quantity indicators **(6)** are located on the centre subpanel.

5.2.3 Annunciator System

The annunciator system consists of an annunciator panel **(9)** mounted in the glareshield, an ANNUN TEST switch on the left side of the pilot's subpanel **(23, not operational)** and a photoelectric cell dimmer switch on the right side of the pilot's subpanel (not visible in this image, not operational).

The annunciators are visible when lit. When an advisory or warning condition covered by the annunciator system occurs, a signal is generated and the appropriate annunciator will remain on while the advisory or warning condition exists.

Annunciator	Colour	Probable Cause for Illumination
LEFT ALTR	Red	Left alternator offline
RIGHT ALTR	Red	Right alternator offline
START	Red	Starter energised
AFT DOOR	Red	Aft utility door unlatched
GEAR UP	Red	Landing gear is up with full flaps, or landing gear is up and manifold pressure is below approximately 13 in Hg on both engines

5.3 Wing Flaps

5.3.1 General

The wing flaps are electrically controlled and actuated. A single electric motor located in the equipment bay under the front seats operates both wing flaps.

5.3.2 Controls

A three-position wing flap switch is located on the co-pilot's subpanel. The flaps have three positions:

- UP (0°)
- APH (15°)
- DN (30°)

The flaps can be moved to either position desired from any previously selected position; there are no intermediate positions.

5.3.3 Indicators

Three flap position lights are located immediately to the left of the flap switch.

Flap Position	Lamp Colour	Placard
UP	None	None
APH (15°)	Blue	APH
DN (30°)	Amber	DN
Not locked in any of the above positions	Red	IN TRANSIT

Lowering the flaps in flight produces the following effects:

- Attitude – nose down
- Airspeed – reduced
- Stall speed – reduced

5.4 Landing Gear

5.4.1 General

The landing gear is electrically controlled and actuated. A single motor located centrally in the equipment bay below the front seats operates all three gear through a system of gears and driveshafts.

5.4.2 Controls

The landing gear is controlled by a two-position switch on the right side of the pilot's sub-panel. Do not operate the landing gear electrically if the hand crank has been engaged to operate the gear manually.

CAUTION: Do not change the position of the control switch to reverse the direction of the landing gear whilst the gear is in transit. This could cause damage to the retract mechanism.



5.4.3 Indicators

Landing gear position lights are located above the control switch. Three green lights, forming a triangle to represent each individual wheel, are illuminated whenever the gear is down and locked.

A red light, immediately to the right of the three green lights, illuminates any time the gear are in transit or in the intermediate position.

All lights are extinguished when all gear are up and locked.

5.4.4 Safety Switches

Safety weight switches are fitted to each main gear strut to prevent accidental gear retraction when the aircraft is on the ground.

WARNING: Never rely on the safety switches to keep the gear extended during ground manoeuvring. Always ensure that the landing gear handle is in the DOWN position on the ground.

5.4.5 Warning System

Should either throttle position be reduced to below that required to sustain level flight with the landing gear retracted a warning horn will sound intermittently and the red GEAR UP annunciator will illuminate. Increasing engine power above the critical power setting will cancel the warning.

If the horn sounds during single-engine operation it can be silenced by advancing the throttle on the inoperative engine until the throttle warning horn switch opens the circuit.

5.4.6 Manual Extension

The landing gear can be manually extended but **not** retracted. This is accomplished by operating the handcrank at the rear of the pilot's seat. In the simulator, the default key command for alternate gear extension is Ctrl-G.

To manually extend the gear, first ensure that the landing gear handle is in the down position and then repeatedly press Ctrl-G to wind the handcrank. Multiple presses (up to 50 turns) are required. The procedure for a manual gear extension is provided in the non-normal checklist.

5.4.7 Brakes

5.4.7.1 General

The braking system consists of two hydraulically-actuated disc brakes, one on each main wheel, brake pedals which are combined with the rudder pedals, and a parking brake handle located at the bottom of the landing gear panel. Each brake can be operated independently, allowing for differential braking.

The hydraulic reservoir for the brakes is located in the nose baggage compartment.

The brake pistons automatically adjust to allow for wear to the brake linings.

No anti-skid system is fitted.

5.4.7.2 Parking Brake

The parking brake sets both main wheel brakes to ON via the hydraulic brake system. The parking brake is operated by a push-pull handle on the pilot's sub-panel, just beneath and to the left of the landing gear lever.

The parking brake is set by pulling the parking brake handle fully out. The parking brake may be released either by pushing the handle fully in, or by depressing and releasing the brake pedals.

5.4.8 Nose Wheel Steering

A spring-loaded linkage from the rudder pedals allows for nose wheel steering. Smooth turning is accomplished by allowing the aeroplane to roll while depressing the appropriate rudder pedal. Sharper turns require light brake pedal pressure on the depressed rudder pedal.

5.4.8.1 Minimum Turning Radius

The minimum wingtip turning radius, using partial braking action and differential thrust, is 31 feet 6 inches.

5.5 Engines

5.5.1 General

The aircraft is fitted with two Teledyne Continental IO-550-C normally-aspirated, 6 cylinder, horizontally-opposed, fuel-injected engines, one on each wing. The maximum power output of each engine is 300 HP at 2,700 RPM.

5.5.2 Controls

Control levers for the propeller, mixture and throttle are grouped along the upper portion of the pedestal. Moving a control lever forward increases its respective function, i.e. opens the throttle, increases propeller RPM or enrichens the mixture. Pulling the lever back decreases its function (closes the throttle, reduces propeller RPM, leans the mixture).

The knobs on the levers are shaped to standard FAA configuration so that they may be identified by touch. The levers are centrally located to allow ease of operation from either the pilot's or copilot's seat.

5.5.3 Induction Air

Induction air is available from filtered ram air or unfiltered alternate air. Filtered ram air enters from the intake air scoop on top of the cowling. Should the filter become obstructed, a spring-loaded door on the alternate air intake will open automatically and the induction system will operate using alternate air taken from the engine accessory section.

5.5.4 Engine Ice Protection

The engine ice protection consists of electrothermal fuel vent heaters controlled by a switch on the left panel and the automatic alternate air induction system.

The only significant ice accumulation is impact ice on the inlet scoop and filter.

5.5.5 Lubrication

5.5.5.1 General

The oil system is a full pressure wet sump system with a full flow, integrally mounted oil filter.

5.5.5.2 Oil Capacity

The maximum oil capacity is 12 US quarts (11.4 litres).

5.5.5.3 Temperature Regulation

Oil temperature is controlled by an automatic thermostat connect to a bypass. The bypass limits oil flow through the oil cooler when operating temperatures are below normal, and will permit the oil to bypass the cooler should it become blocked.

5.5.6 Cowl Flaps

Each engine is fitted with a cowl flap controlled by a manual control lever located on the lower centre console. The cowl flap is close when the lever is in the up position, and open when the lever is in the down position.

5.6 Propellers

5.6.1 General

Each engine is fitted with a 77-inch diameter McCauley three-bladed constant-speed, variable-pitch propeller constructed of aluminium alloy.

Pitch Setting (30 inch station)	
Fine pitch	15.2° ± 0.5°
Feathered	82.5° ± 0.5°

5.6.2 Pitch Control

Propeller RPM is controlled by a governor in each engine which regulates oil pressure to the hubs. Push-pull levers on the centre pedestal allow the pilot to select the RPM required for each governor.

If engine oil pressure is lost, the propeller will go to the full coarse pitch position. This is because propeller fine pitch is obtained by governor-boosted engine oil pressure working against the centrifugal twisting moment of the blades.

The propellers should be cycled occasionally during cold weather operation. This is to help maintain warm oil in the propeller hubs so that the oil will not congeal.

5.6.3 Propeller Synchroniser

5.6.3.1 General

The propeller synchroniser automatically matches the RPM of both propellers. The system's range of authority is limited to approximately 25 rpm. Normal governor operation is unchanged but the synchroniser continually monitors propeller RPM and adjusts one governor as required.

A magnetic pickup mounted in each propeller governor transmits electric pulses to a transistorised control box installed behind the pedestal. The control box converts any pulse rate differences to correction commands, which are then transmitted to the appropriate governor.

5.6.3.2 Control and Operation

The propeller synchroniser is operated through a toggle switch installed on the pilot's sub-panel. To operate the system, first synchronise the engines and propellers using the procedure outlined below:

Engine Synchronisation

- First set both engines to the desired throttle and RPM settings by reference to the instruments
- Slowly advance the right throttle and note whether there is a harmonic oscillating sound, and whether the frequency gets faster or slower
- If faster, move the throttle slowly back and monitor the sound
- If slower, continue to move the throttle slowly forward

Propeller Synchronisation

- First set both engines to the desired throttle and RPM settings by reference to the instruments and synchronise the engines as outlined above
- If vibrations/"beats" are occurring, slowly retard the right propeller control lever. If the right propeller RPM is higher than the left propeller RPM, the audio beats will reduce progressively: continue gently retarding the lever until the beats smooth out
- If the right propeller RPM is lower than the left propeller RPM, the beats will increase in frequency as you retard the prop control lever: in this case slowly advance the prop control lever until the propellers are synchronised

Once this procedure has been completed, the Prop Sync toggle switch can be selected ON.

If the power setting is to be changed, the propeller synchroniser must first be turned off before setting the new RPM and manifold pressure. If required, the above procedure can then be repeated to re-synchronise the propellers.

5.6.3.3 Propeller Synchroscope

A propeller synchroscope is located centrally between the Manifold Pressure and RPM gauges and provides a visual indication of synchronisation of propellers. If the right propeller is operating at a higher RPM than the left, the synchroscope spins in a clockwise direction. Anticlockwise rotation of the synchroscope indicates a higher RPM of the left propeller.

5.7 Fuel System

5.7.1 General

The fuel system is an OFF-ON-CROSSFEED arrangement and consists of two fuel cell tanks, one in each wing.

A vapour return line returns excess fuel from the engine to its respective wing system. All the fuel cells in each wing are interconnected in order to make all the usable fuel in each wing available to its respective engine when the fuel selector is turned ON.

5.7.2 Tank Capacity

Each fuel cell has a capacity of 71 US gallons (269 litres) for a total capacity of 142 US gallons (537 litres).

3 US gallons (11 litres) in each tank are unusable, to give a total usable capacity of 136 US gallons (514 litres).

5.7.3 Controls

The fuel selector panel is located on the floor between and forward of the two pilots' seats. It houses a fuel selector for each engine together with an associated schematic diagram of the fuel flow.



The fuel selector panel can be difficult to see and access in the virtual cockpit and so the pop-up panel, accessed by pressing Shift-4, may be useful.

WARNING: Selectors must be positioned in detents only. There is no fuel flow to the engines between the detents, indicated by red arcs.

5.7.4 Indicators

5.7.4.1 Fuel Quantity Indicators

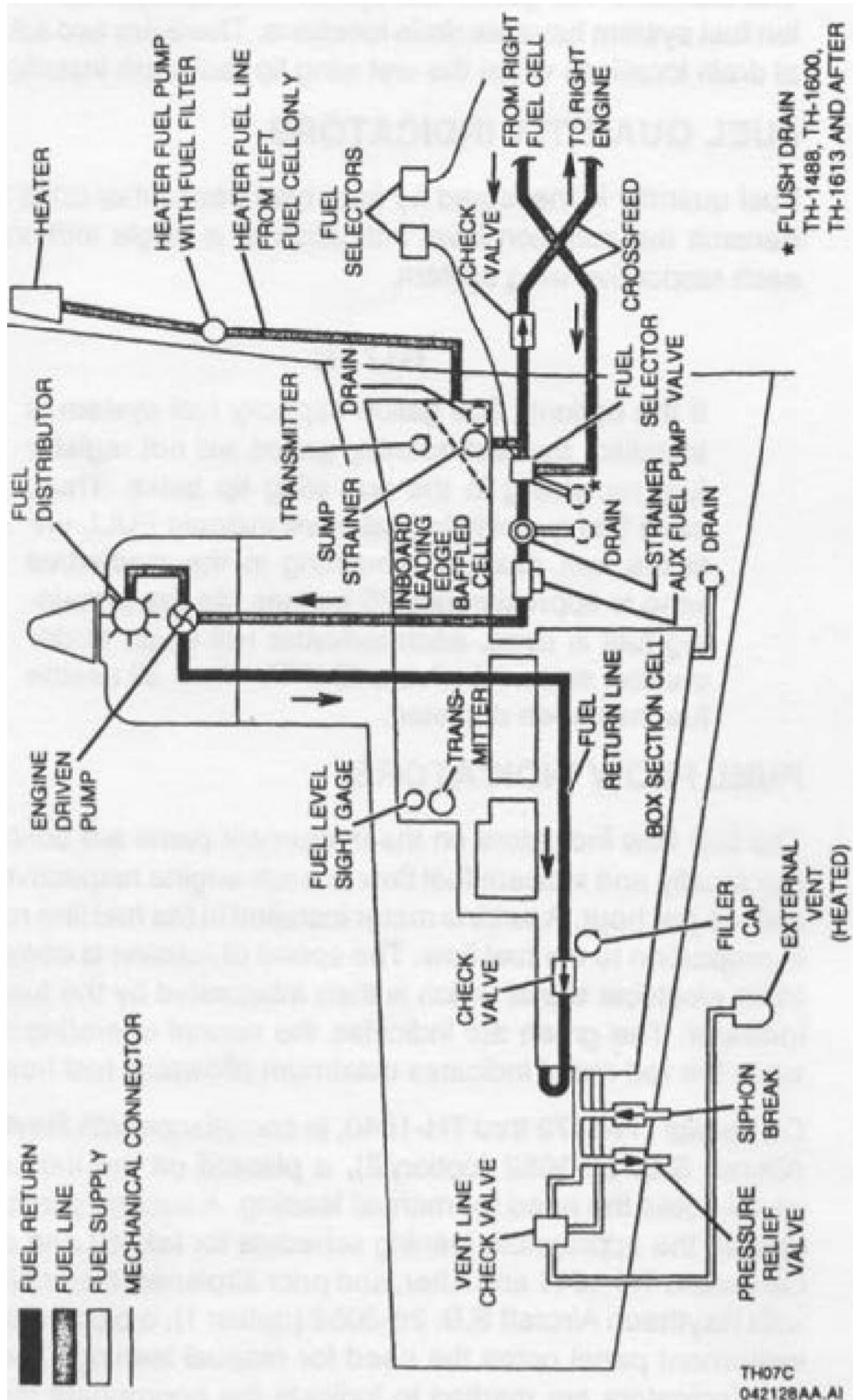
Fuel quantity is measured by float-type transmitter units which transmit the common level indication to a single indicator for each respective wing system.

5.7.4.2 Fuel Flow Indicators

Fuel flow gauges on the centre instrument panel show fuel flow in US gallons per hour. They are fed from electrical signals from turbine meters in the fuel flow lines to each engine.

The green arc indicates the normal operating range while the red radial indicates maximum allowable fuel flow.

5.7.5 Fuel System Schematic



5.7.6 Fuel Crossfeed

The fuel lines for the engines are interconnected by crossfeed lines. During normal operation each engine uses its own fuel pumps to draw fuel from its respective wing system. However, in an emergency the crossfeed system allows either engine to consume the available fuel from the opposite side.

The fuel crossfeed system is provided for use during emergency conditions. The system cannot transfer fuel from one wing system to the other. The procedure for using the crossfeed system is described in the Non-Normal Checklist.

5.7.7 Engine Driven Fuel Pumps

The engines are equipped with engine-driven fuel pumps which require manual leaning.

5.7.8 Fuel Boost Pumps

5.7.8.1 General

The fuel boost pumps are dual-speed, dual-pressure, electrically-driven vane-type pumps.

5.7.8.2 Controls

The fuel boost pumps are controlled through three-position switches located on the pilot's sub-panel.

5.7.8.3 Operation

The LO position is used to supply a low boost to the fuel flow during all flight conditions as required. The pumps are used to perform the following functions:

Switch Position	Function
LO	Minor vapour purging
	Increasing fuel flow
	Crossfeeding fuel for one engine inoperative operation
HI	Normal start, priming
	Extreme vapour purging
	To provide fuel pressure in the event of engine-driven pump failure

5.7.9 Fuel Required For Flight

Flight planning and fuel loading is facilitated by the use of fuel quantity indicators that have been coordinated with the usable fuel supply. It is the pilot's responsibility to ascertain that the fuel quantity indicators are functioning and maintaining a reasonable degree of accuracy, and be certain of ample fuel for a flight. A minimum of 13 gallons of fuel is required in each wing system before takeoff.

5.8 Electrical System

5.8.1 General

The aircraft's circuitry is for the most part of single-wire, ground return type.

5.8.2 Controls

The battery, magneto/start and alternator switches are located on the pilot's subpanel. This panel contains most of the electrical system switches and circuit breakers. Each is placarded as to its function. Additional circuit breakers are located on the pilot's side panel. Avionics circuit breakers are located on the co-pilot's subpanel.

5.8.3 Batteries

Two 25 Ah, 12V lead-acid batteries, connected in series, are installed beneath the floor of the nose baggage compartment.

5.8.4 Alternators

5.8.4.1 General

Two 60A, 28V gear-driven alternators are installed, one for each engine. Each alternator is individually controlled by alternator control units which regulate the voltage, balance the load and provide overvoltage protection.

5.8.4.2 Controls

Each alternator system is controlled by a switch located on the pilot's subpanel.

5.8.4.3 Indicators

Individual alternator output is indicated by two vertical scale loadmeters on the centre subpanel, which register alternator load in amperes.

A horizontal scale voltmeter immediately below the loadmeters monitors bus voltage.

The normal voltmeter reading of 28-29V with the alternator operating will drop to 24V if both alternators are switched off and electrical power is received directly from the battery installation.

Two red annunciators placarded LEFT ALTR and RIGHT ALTR, located in the annunciator panel, will flash whenever the respective alternator is disconnected from the bus by low voltage or an over-voltage condition. The annunciators will stay illuminated whenever the respective LEFT ALT or RIGHT ALT switches are placed in the OFF position. Any time a failure is detected, the appropriate alternator should be turned off.

5.8.5 Starters

5.8.5.1 General

The starters are relay-controlled.

5.8.5.2 Controls

The starter relays are actuated by rotary-type, momentary-on switches incorporated in the magneto/start switches located on the pilot's subpanel.

5.8.5.3 Indicators

The red annunciator placarded START will illuminate whenever electrical power is being supplied to either the left or right starter. If the annunciator remains illuminated after starting, the start relay has remained engaged and loss of electrical power may result.

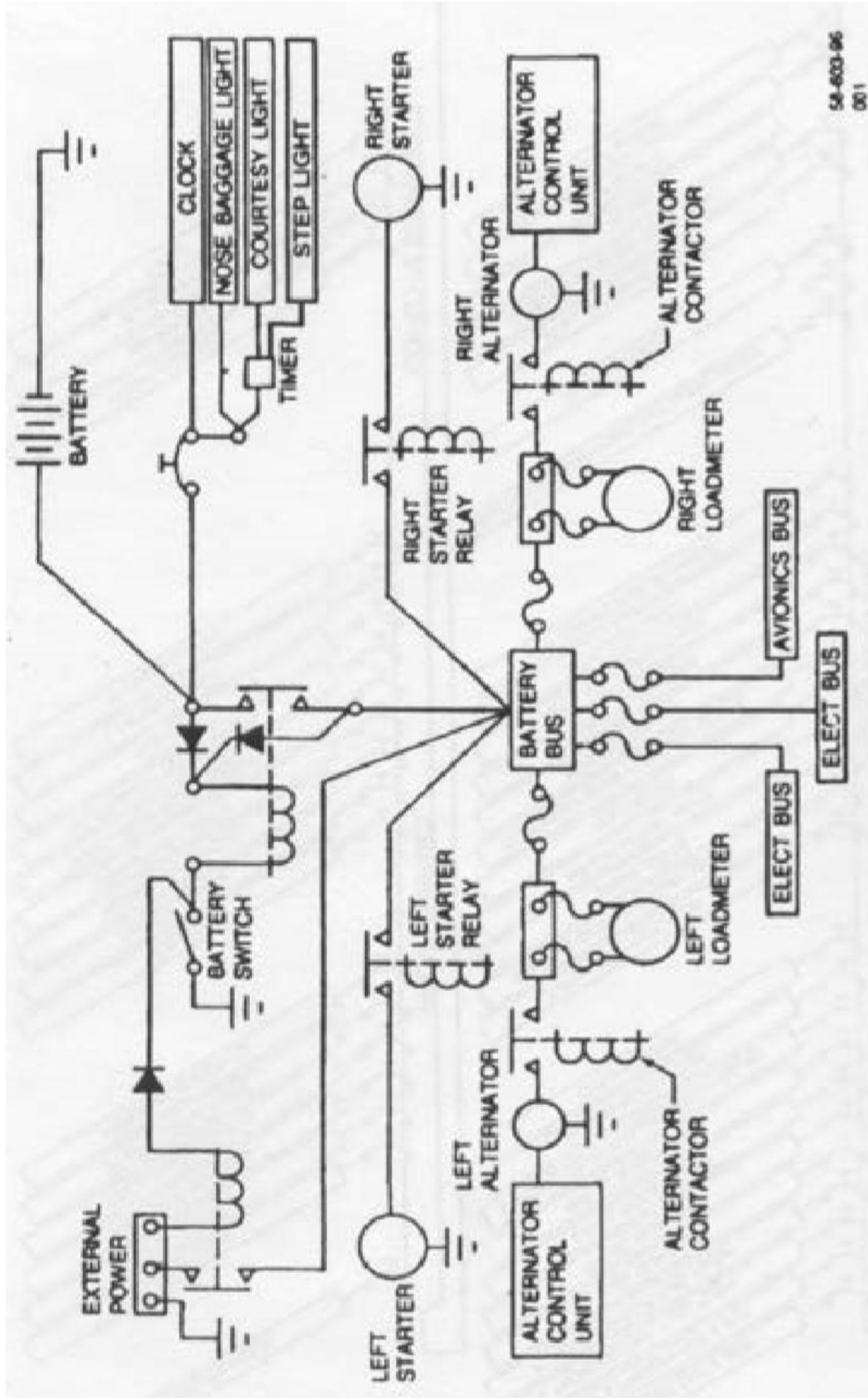
5.8.5.4 Operation

To energise the starter circuit, hold the magneto/start switch in the START position.

If the START annunciator remains lit after starting, the battery and both alternator switches should be placed in the OFF position.

If the annunciator does not illuminate during starting, that portion of the annunciator system is inoperative and the loadmeters should be monitored to ensure that the starters do not remain engaged after starting.

5.8.6 Electrical System Schematic



5.9 Lighting System

5.9.1 Interior Lighting

The instrument panel lighting ON-OFF switch, placarded PANEL, is located on the pilot's subpanel.

5.9.2 Exterior Lighting

5.9.2.1 General

The exterior lighting system consists of:

- A landing light in the front lower section of each engine cowling
- A taxi light located in the nose gear
- White anti-collision (strobe) lights located on each wingtip
- A red anti-collision (beacon) light located on top of the vertical stabiliser
- Navigation lights located on each wingtip and on the aft empennage

5.9.2.2 Controls

The switches for the navigation and landing lights, plus the switches for the anti-collision lights, nose gear taxi light and wing ice light are grouped on the pilot's subpanel.

5.9.2.3 Operation

For longer lamp service life, the landing lights should be used only when necessary. Prolonged operation of the landing lights during ground manoeuvring should be avoided as this may cause overheating.

At night, reflections from anti-collision lights on clouds, dense haze or dust can produce optical illusions and vertigo and these lights may be switched off in such conditions at the pilot's discretion if they are considered to be distracting.

5.10 Environmental System

5.10.1 General

The environmental system consists of heating and ventilating systems and their associated controls. A cooling system is also fitted.

5.10.2 Cabin Heating

5.10.2.1 General

A 50,000 BTU combustion heater, located in the nose gear wheel well, supplies heated air to the cabin. Ram air enters through intakes located on each side of the nose cone. After the air passes through the heater it is distributed to five cabin outlets.

Outlets are located:

- Above the pilot's and co-pilot's rudder pedals
- At the rear of the co-pilot's seat
- At the rear of the No. 4 passenger seat position
- On top of the glareshield for windshield defrosting

Fuel for the heater is obtained from the left fuel tank. Fuel consumption is approximately 1 GPH.

5.10.2.2 Controls

The heater is controlled by a HEATER and BLOWER switch located on the pilot's subpanel, a CABIN VENT AIR control located on the pilot's left sidewall, a CABIN HEAT control knob located below the pilot's left subpanel and a landing gear position switch.

The heater system is protected by the following items:

- An over-temperature switch located on the aft end of the heater accessible from the nose gear wheel well. This switch will turn off the heater system if the heater burner can reaches 300°F (148°C). The switch is manually resettable from the nose gear wheel well.
- An air pressure switch which removes power from the ignition system and the heater fuel pump if the heater blower or combustion air fails
- A fuel pressure switch which removes power from the heater if heater fuel flow becomes insufficient

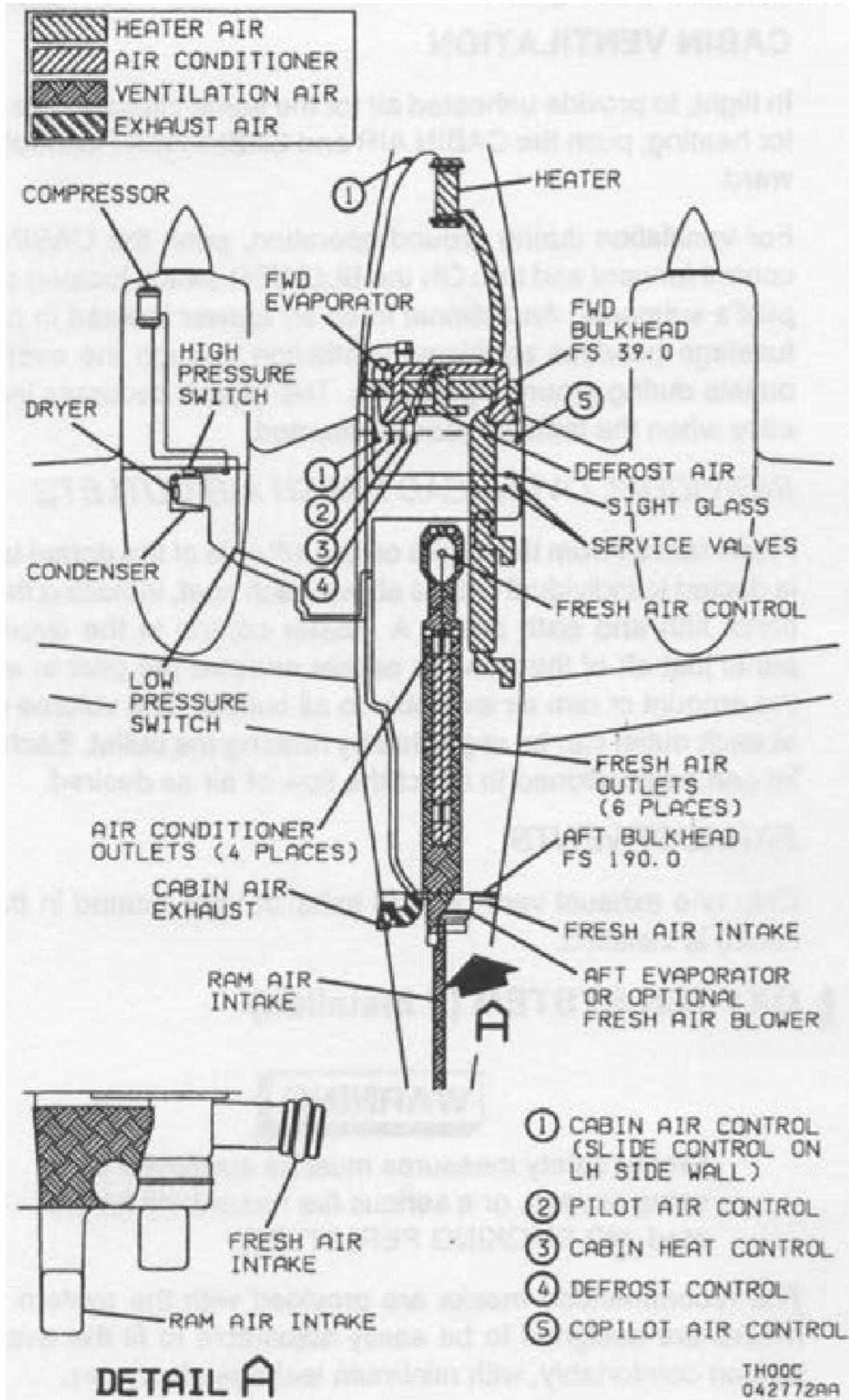
The distribution of the heated air is controlled by the following controls:

- Pilot Air control knob, located below the pilot's subpanel. Pulling the knob out increases the airflow at the pilot's feet.
- Co-pilot Air control knob, located below the co-pilot's subpanel. Pulling the knob out increases the airflow at the co-pilot's feet.
- Defrost control knob, located below the pilot's subpanel. Pulling the knob out increases the airflow to the defrost system.

The heater outlets located behind the co-pilot's seat and the No. 4 passenger seat are not directly controllable. To increase the airflow from these outlets, push in the controls for the pilot's air, co-pilot's air and defrost.

Switch	Function
HEATER switch	<p>If sufficient air flow is present:</p> <ul style="list-style-type: none"> • Activates the heater fuel pump • Activates the heater combustion air blower • Activates the heater igniter • Activates the heater blower <p>The heater blower automatically turns off when the landing gear is retracted and back on when the landing gear is extended.</p>
BLOWER switch	<p>Turns the heater blower on.</p> <p>May be used independent of heater operation to increase air circulation during ground operations.</p> <p>If the heater blower is activated by this switch, it will automatically turn off when the landing gear is retracted and back on when the landing gear is extended.</p> <p>If the heater is to be shut down during ground operations, the blower should be left on for approximately 2 minutes after turning the HEATER switch off to avoid over-tempering the heater.</p>
CABIN VENT AIR control	<p>Adjusts the iris valve located in the forward portion of the heater. Pushing the control forward increases the opening of the valve. Pulling the control after decreases the opening of the valve.</p> <p>If the lever is pulled more than half way aft, the resulting airflow will be insufficient for heater operation and the heater will automatically turn off.</p>
CABIN HEAT knob	<p>Adjusts the thermostat sensor located in the heater duct.</p> <p>Pulling the knob out increases the thermostat setting to a maximum temperature of approximately 180°F (82°C).</p> <p>When the duct temperature reaches the thermostat setting, fuel is cut off to the heater.</p>

5.10.3 Environmental System Schematic



5.10.4 Cabin Ventilation

5.10.4.1 General

In flight, to provide unheated air from the same cabin outlets used for heating, push the CABIN AIR and CABIN HEAT controls forward.

For ventilation during ground operation, push the CABIN AIR control forward and turn ON the BLOWER switch located on the pilot's subpanel. The blower becomes inoperative when the landing gear is retracted.

5.10.4.2 Overhead Fresh Air Outlets

Fresh ram air from the intake on the left side of the dorsal fairing is ducted to individual outlets above each seat. A master control in the overhead panel just aft of the front air outlets allows the pilot to adjust the amount of ram air available to all outlets. The volume of air at each outlet can be regulated by rotating the outlet. Each outlet can be positioned to direct the flow of air as desired.

5.10.4.3 Exhaust Vents

One exhaust vent is installed in the aft cabin.

5.11 Pitot and Static System

5.11.1 General

The pitot and static system provides a source of impact air and static air for the operation of flight instruments.

5.11.2 Pitot System

5.11.2.1 General

A pitot tube for the pilot's flight instruments is located immediately to the left of the nose gear doors.

Pitot heat switches located on the pilot's subpanel supply heat to the pitot mast. Note that whilst left and right pitot heat switches are installed on the subpanel, in the BAV Baron fleet only the standard left pitot tube is installed.

5.11.3 Normal Static System

5.11.3.1 General

The normal static air system opens to the atmosphere through two static air ports, one on each side of the aft fuselage. The static air obtained at these ports is routed to the airspeed indicator, altimeter and vertical speed indicator.

5.11.3.2 Controls

A static air drain is installed on the lower forward left hand sidewall. The static air is drained by raising the lever to the OPEN DRAIN position. Return the lever to the CLOSE DRAIN position after the line is completely drained.

This function is not simulated in the BAV Baron.

5.11.4 Emergency Static System

5.11.4.1 General

The emergency static air system is designed to provide a source of static pressure to the flight instruments from inside the cabin should the normal outside static air ports become blocked. An abnormal reading of the instruments supplied with normal static air could indicate a restriction in the outside static air ports.

5.11.4.2 Controls

A two position lever, located on the left sidewall adjacent to the pilot, is placarded OFF NORMAL, ON EMERGENCY. When it is desired or required, select the ON EMERGENCY position. Refer to the Airspeed Calibration and Altimeter Correction graphs in Chapter 6 when operating on normal or emergency static air.

5.12 Instrument Air Pressure System

5.12.1 General

The instrument air pressure system consists of two engine-driven, dry-pressure pumps interconnected to form a single system. If either pump fails, check valves automatically close and the remaining pump continues to operate all gyro instruments.

Two filters per engine are installed, one of the rear baffle of the engine to filter intake air to the pressure pump and a second downstream of the pump, aft of the firewall in the upper nacelle. This filter protects the instruments from carbon dust.

5.12.2 Indicators

A pressure gauge on the instrument panel indicates pressure in inches of mercury. Two red buttons on the pressure gauge serve as source failure indicators, each for its respective side of the system.

A deicing pressure gauge is installed on the lower centre panel and indicates pressure being supplied to the de-ice boots in PSI.

5.12.3 Loads

The instrument air pressure system supplies air for:

- Operation of the artificial horizon
- Operation of the Horizontal Situation Indicator
- Autopilot gyros
- De-ice boots

5.13 Stall Warning System

5.13.1 General

The stall warning system consists of an electronic stall warning horn installed forward of the instrument panel and a sensing vane on the leading edge of the left wing.

The sensing vane is effective in all flight attitudes and at all weights and airspeeds.

Note: The stall warning horn is inoperative when the battery and alternator switches are turned off. Aircraft certification requires the stall warning system to be on at all times during flight except in emergency conditions where directed by a non-normal checklist.

5.13.2 Controls

A switch on the left subpanel placarded STALL WARN HEAT controls electrical power to the stall warning heater elements.

5.13.3 Indicators

The stall warning sounds when triggered by the sensing vane. Irregular and intermittent at first, the warning signal becomes steady as a complete stall is approached.

5.14 Ice Protection System

5.14.1 General

The ice protection system consists of:

- Pneumatic de-ice boots cemented to:
 - The leading edges of both wings
 - The leading edges of the horizontal stabiliser
 - The leading edge of the vertical stabiliser
- An electrothermal heated windshield segment
- Electrothermal propeller de-ice boots bonded to each propeller blade
- Heating elements installed in the pitot mast
- Heating elements installed in the stall warning vane and mounting pad
- Heating elements installed in the fuel system vents on the underside of each wing outboard of the engine nacelle

5.14.2 Surface De-ice Boots

5.14.2.1 General

Surface de-ice boots are cemented to the leading edges of both wings, the leading edge of the horizontal stabiliser and the leading edge of the vertical stabiliser.

The surface de-ice is pneumatically operated. Compressed air from the instrument air pressure system passes through the pressure regulators, before being supplied to the distributor manifold.

When the de-ice system is not in operation, the distributor valve applies vacuum to the boots to deflate and hold the boots flat against the surface.

When the de-ice system is activated, the distributor valve changes from vacuum to pressure and the boots inflate.

5.14.2.2 Controls

The BAV Baron fleet is fitted with a two-position surface de-ice switch located on the pilot's subpanel. When the switch is in the down position, the surface de-ice is selected OFF. To activate the surface deice, move the switch up in to the AUTO position.

In the AUTO position, the de-ice boots inflate for a period of approximately 12 seconds, then deflate automatically and return to the vacuum hold-down position. The switch must be tripped for each complete cycle.

5.14.2.3 Operation

The de-ice boots are intended to remove ice after it has accumulated rather than to prevent its formation. If the rate of ice accumulation is slow, best results are obtained by leaving the de-ice system OFF until ½ to 1 inch of ice accumulates. Bridging can occur if boots are actuated too early or too frequently.

CAUTION: Operation of the surface de-ice system in ambient temperatures below -40°C can cause permanent damage to the de-ice boots.

5.14.3 Electrothermal Heated Windshield Segment

5.14.3.1 General

A segment of the windshield is fitted with electrothermal heating elements to provide anti-icing, de-icing and de-fogging.

5.14.3.2 Controls

The electrically-heated segment of the windshield is controlled by a switch located on the pilot's subpanel (not simulated in the BAV Baron).

5.14.3.3 Operation

CAUTION: Ground use of windshield heat is limited to 10 minutes.

Operation of the windshield heat will cause the standby compass to become erratic. For this reason windshield heat should be turned OFF for a period of 15 seconds to allow a stable reading on the standby compass.

Windshield heat is designed for continuous in-flight use and should be applied prior to encountering icing conditions.

The system is also beneficial as an aid in preventing frost and fogging due to rapid descents from higher altitudes in to warm, moist air.

5.14.4 Pitot Heat

5.14.4.1 General

The pitot mast is equipped with a heating element to prevent the build-up of ice.

5.14.4.2 Controls

The heating element is controlled by a switch located on the pilot's subpanel.

5.14.4.3 Operation

The pitot heat should remain OFF during ground operations except for testing or short intervals of time to remove ice or snow from the mast.

It is standard BAVirtual practice to select the pitot heat ON prior to takeoff and OFF after vacating the runway after landing.

5.14.5 Stall Warning Anti-Ice

5.14.5.1 General

The mounting pad and stall warning vane are equipped with electrothermal heating elements to prevent obstruction of the stall warning vane as a result of ice build-up.

5.14.5.2 Controls

The heating elements are activated any time the switch on the pilot's subpanel placarded STALL WARN HEAT is turned on (not simulated in the BAV Baron).

5.14.6 Heated Fuel Vents

5.14.6.1 General

Electrothermal heating elements are fitted to each fuel system vent, one on the underside of each wing outboard of the nacelle.

5.14.6.2 Controls

The fuel vent heaters are controlled by the FUEL VENT switch on the pilot's subpanel (not simulated in the BAV Baron).

6 Performance Data

6.1 Power Settings

Climbing								
Situation	Flap	Gear	MAP	RPM	Fuel Flow	Mixture	Pitch	IAS
Rotate	UP	DOWN	29"	MAX		RICH	+10°	85 kts
Best angle of climb V_X	UP	UP	29"	2700		RICH	+17.5°	92 kts
Best rate of climb V_Y	UP	UP	29"	2700		RICH	+15°	105 kts
Best single engine rate of climb V_{YSE}	UP	UP	29"	MAX		RICH	+6°	100 kts
Cruise Climb	UP	UP	27"	2500		RICH	+7.5°	135 kts

Level Flight								
Situation	Flap	Gear	MAP	RPM	Fuel Flow	Mixture	Pitch	IAS
Stall on base turn	APH	DOWN	15"	MAX		RICH	Inc to +10°	V_{SO}
Stall on final	DN	DOWN	15"	MAX		RICH	Inc to +13°	V_{SO}
Visual Circuit	UP	UP	14"	2500		RICH	+4°	120 kts
Asymmetric cruise	UP	UP	25"	2500	16 GPH	LEAN	0°	145 kts
Holding	UP	UP	16"	2100	18 GPH	LEAN	+4°	120 kts
Economy (standard use at BAVirtual)	UP	UP	21"	2100	24 GPH	LEAN	0°	160 kts
Normal	UP	UP	23"	2300	26 GPH	LEAN	0°	175 kts
High speed	UP	UP	25"	2500	32 GPH	LEAN	0°	190 kts

Descent								
Situation	Flap	Gear	MAP	RPM	Fuel Flow	Mixture	Pitch	IAS
Cruise descent	UP	UP	16"	2100		LEAN	-2°	160 kts
Initial approach	UP	UP	16"	2100		RICH	+4°	120 kts
Asymmetric initial approach	UP	UP	21"	2500		RICH	+4°	120 kts
IFR final and VFR base	APH	DOWN	15"	MAX		RICH	0°	110 kts
Asymmetric final	APH	DOWN	23"	MAX		RICH	1°	105 kts
Short Final	DN	DOWN	15"	MAX		RICH	0°	95 kts
V_{AT}	DN	DOWN	A/R	MAX		RICH	A/R	90 kts