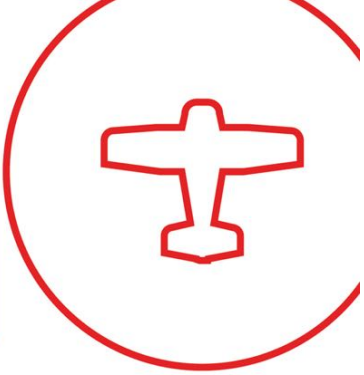
AL250



COMPLEX SINGLE ENGINE PISTON AIRCRAFT FLIGHT MANUAL

alsim
FLIGHT TRAINING SOLUTIONS

Table of Contents

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0 General

0-1 INTRODUCTION

This is the flight manual for the ALSIM Flight Training Device model AL250.
The flight modelling software represents a single piston engined flight model with variable pitch propeller, retractable landing gear and classic instrumentation.

This manual contains the information needed by the pilot to operate the trainer. The procedures presented are the result of ALSIM's knowledge and experience up to the date of issue of the manual or its latest revision. The manual is not intended to be a guide for basic flight instruction or a training manual.

For information on the Instructor Station, please refer to the Instructor's Manual, for maintenance information to the Maintenance Manual.

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0-2 REVISIONS LOG

Rev. No.	Description	Issue Date	Page(s) Affected
1.1	Stall Speeds Added	07/11/2017	1-2
1.1	Service Ceiling Added	07/11/2017	4-1
1.1	Added note to Cowl Flaps section	07/11/2017	6-13
1.1	Added Vacuum Pump Failure procedure	07/11/2017	3-9
1.2	Added Fuel Pressure Gauge	19/03/2018	6-17
1.2	Added Pitot Heat Information	16/04/2018	6-60
1.3	Updated Performance Table	08/08/2018	4-1
1.3	Added ALSIM ALA-500 section	08/08/2018	6-37
1.3	Updated EHSI section	08/08/2018	6-30
1.4	Added manual landing gear note	06/09/2018	3-7
1.5	Updated Emergency Landing Gear section	15/01/2019	6-21
1.6	Updated Electrical System diagram	06/06/2019	6-46
1.7	Added DME information to EHSI section	02/02/2021	6-30
1.8	Added Alternate Air information	12/02/2021	6-12
1.8	Added Alternate Static Valve information	12/02/2021	6-61

Table 1: Document Revisions Log

0-3 SAFETY INSTRUCTIONS

WARNING
This Synthetic Training Device has been designed for professional flight training. Whenever somebody is "flying" it, an instructor trained to its use must be present!

Assuming the trainer is installed correctly and in proper working order, there is only a minimum of rules to follow:

CAUTION
Do not smoke, eat or drink in the cockpit or at the Instructor Station!

As a user, do not open the hood covering the trainer mechanical parts! Or, if it is open, do not close it (and don't touch anything inside).

For further safety information, on topics such as installation, moving or cleaning of the trainer, please see the Maintenance Manual.

0-4 EMERGENCY STOP

In case of an emergency (and only in this case!), use one of the emergency buttons to stop the trainer.

There are two emergency stop buttons: One on the start/stop panel in the Instructor Station; the second one is connected to the panel by means of a cable and can be used either inside or outside the cockpit.

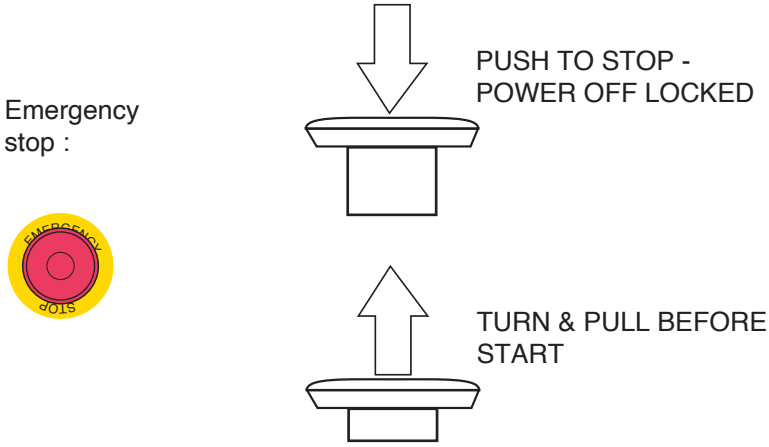

Figure 1: Emergency Stop

In the case of an emergency, hit the button - the electrical power supply to the trainer will be cut.

Have the problem solved before restarting the trainer.

To restart the trainer after having pushed the emergency button, release the emergency stop by turning it clockwise. This will make it jump out again. Then follow the start procedure.

0-5 USING THIS MANUAL

DEFINITIONS OF WARNINGS, CAUTIONS AND NOTES

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

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

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

0-6 GLOSSARY

This is not intended as a complete list of aeronautical terminology, but is an explanation of some of the terms used in this manual.

AC: Alternating current

ADC: Air data computer

ADF: Automatic direction finding

ADI: Attitude and direction indicator

AHRS: Attitude heading reference system

ALS: Approach Light System

AOA: Angle Of Attack (degrees)

AP: Autopilot

ATC: Air traffic control

BITD: Basic Instrument Training Device

BOW: Basic Operating Weight

BRG: Bearing

CAS: Calibrated Airspeed means the indicated speed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

CAT: Clear Air Turbulence

CAT I: ILS Category I approach procedure which provides for an approach to a decision height not lower than 200 feet (60m) and a visibility not less than 2,400 feet (800m) or a Runway Visual Range not less than 1,800 feet (550m).

CAT II: (Special authorization required) ILS Category II approach procedure which provides for an approach to a decision height lower than 200 feet (60m) but not lower than 100 feet (30m) and a Runway Visual Range not less than 1,200 feet (350m).

CAT III: (Special authorization required) ILS Category III approach procedure which provides for an approach with either a decision height lower than 100 feet (30m) or with no decision height and with a Runway Visual Range not less than 700 feet (200m).

C/B: Circuit breaker

CDI: Course Deviation Indicator

DC: Direct current

DME: Distance measuring equipment

EAT: Entering Air Temperature

ECU: Engine Control Unit. Computer that measures all the necessary parameters for FADEC calculations.

EFIS: Electronic Flight Instrument System

EGT: Exhaust gas temperature

EID: Engine Instrument Display

ESI: Electronic Standby Instrument

ETA: Estimated Time of Arrival

FAA: Federal Aviation Administration

FADEC: Fully Automated Digital Engine Control. Computer that calculates the best engine parameters according to pilot input and ECU measurements.

FCP: Flight Control Panel

FD: Flight director

FDU: Fire Detection Unit

Feathered propeller: Propeller blade at an angle which offers minimum drag and propeller rotation is at or near zero.

FF: Fuel Flow

FMA: Flight Mode Annunciator

FNPT: Flight Navigation and Procedures Trainer (ground-based training device which represents the flight deck environment of a class of aeroplanes) - for details see the JAR-STD 3A.

FOB: Fuel on Board

g: Acceleration due to gravity

GNS: Global Navigation System

GPWS: Ground Proximity Warning System

GS: Ground Speed

G/S: Glideslope

HDG: Heading

HSI: Horizontal situation indicator

IAS: Indicated Airspeed, the speed of an aircraft as shown on the airspeed indicator.

IATA: International Airline Transport Association

ICAO: International Civil Aviation Organization

IDG: Integrated Drive Generator

IFR: Instrument flight rules

ILS: Instrument landing system

ILS Category IIIB (ICAO): (Special authorization required) An ILS approach procedure which provides for an approach with either a decision height lower than 50 feet (15m) or with no decision height and with a Runway Visual Range not less than 700 feet (200m) but not less than 150 feet (50m).

ILS Category IIIC (ICAO): (Special authorization required) An ILS approach procedure which provides for an approach with no decision height and no Runway Visual Range limitations.

IOS: Instructor Operating Station

IQTG: International Qualification Test Guide (RAeS Document)

ISA: International Standard Atmosphere: 15°C and 1013.2 hPa at MSL (mean sea level), with a decrease of 6.5°C per 1000 m of altitude from MSL to 11000 m.

ITT: Interturbine temperature

JAA: Joint Aviation Authorities

JAR: Joint Aviation Requirements

JAR STD 3A: Joint Aviation Requirements regarding Aeroplane Flight & Navigation Procedures Trainers

KCAS: Calibrated airspeed in knots

KIAS: Indicated airspeed in knots

LGCUI: Landing Gear control and Interface Unit

LSK: Line Select Key

M: Mach Number

MAA: Maximum Authorized IFR Altitude

MAC: Mean Aerodynamic Chord

mb: millibar - unit for pressure (see below under 'units')

MALS: Medium intensity Approach Light System

MALSR: Medium intensity Approach Light System with Runway alignment indicator lights

MCC: Multi-Crew Co-operation

MCDU: Multi-function Control and Display Unit

MDA: Minimum Descent Altitude

MEA: Minimum En route IFR Altitude

MFD: Multi-Function Display

MM: Middle Marker

MOCA: Minimum Obstruction Clearance Altitude

MQTG: Master Qualification Test Guide

MSD: Multi-System Display

MSL: Mean sea level

N1: Engine low pressure rotor revolutions per minute

N2: Engine high pressure rotor revolutions per minute

NDB: Non-Directional Beacon

NWA: Nose Wheel Angle (degrees)

OAT: Outside air temperature

OBI: Omni-bearing indicator

OBS: Omni-bearing selector

OM: Outer Marker

OVRD: Override

PAPI: Precision Approach Path Indicator System

PAR: Precision Approach Radar

PAX: Passenger

PFD: Primary Function Display

Pressure altitude: Altitude measured from standard sea level pressure (1013.2 hPa) by means of a pressure (barometric) altimeter.

psi: Pounds per square inch - unit for pressure (see below under 'units')

PSIG: Pounds per Square Inch Gauge

QTG: Qualification Test Guide

RA: Resolution Advisory

RMI: Radio magnetic indicator

RPM: Revolutions per minute - unless otherwise indicated, in this manual the term refers to the propeller revolutions.

RVR: Runway Visual Range as measured in the touchdown zone area (meters or feet)

SAT: Static Air Temperature

SOC: Statement Of Compliance

SSALS: Simplified Short Approach Light System

SSALSR: Simplified Short Approach Light System with Runway alignment indicator lights

STD: Synthetic Training Device

T/O: TakeOff

TA: Traffic Advisory

TACAN: Ultra-high frequency Tactical Air Navigational aid

TAS: True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressiblility.

TAT: Total Air Temperature

TCAS: Traffic Collision Avoidance System

TGFD: Trim, Gear and Flaps Display.

TGT: Target

Unusable fuel: Fuel that is not available to the engine (due to tank configuration etc.)

Usable fuel: Fuel available for flight planning

V_A: Maneuvering speed: Maximum speed at which application of full available aerodynamic control will not overstress the airplane

V_{FE}: Maximum flaps extended speed: Maximum speed with wing flaps in extended position

V_{FO}: Maximum flaps operation speed: Maximum speed at which flaps may be extended or retracted

VHF: Very High Frequency

VFR: Visual flight rules

V_{LE}: Maximum landing gear extended speed: Maximum speed with landing gear extended

V_{LO}: Maximum landing gear operating speed: Maximum speed at which the landing gear may be extended or retracted

V_{MCA}: Minimum control speed in flight (not applicable to single-engine aircraft): Minimum speed at which the airplane is controllable with one engine inoperative, the other engine at take-off power and a bank angle of not more than 5° into the operative engine.

V_{MO}: Maximum operating speed: Speed that may not be exceeded in normal flight operation

V_{NE}: Never exceed speed: Speed that may never be exceeded under any circumstances

VOR: Very high frequency omni-directional range

V_X: Best angle-of-climb speed: Speed for the greatest gain in altitude in the shortest possible horizontal distance.

V_Y: Best rate-of-climb speed: Speed for the greatest gain in altitude in the shortest possible time.

$V_{Y\ SE}$: Best single-engine rate-of-climb speed: Speed for the greatest gain in altitude in the shortest possible time with one engine inoperative.

SBAS: Satellite Based Augmentation System. Where available, enables aircraft to rely on GPS for all phases of flight, including precision approaches to any airport within its coverage area.

WAT: Weight, Altitude, Temperature

WAL: Warning and Advisory List

Windmilling propeller: Propeller rotating from airstream inputs

0-7 UNITS OF MEASUREMENT

Again, this is not a complete units conversion table, but only a list of those units used in ALSIM Flight Manuals. All figures are rounded to the third digit after the decimal point.

0-7-1 Speed

1 Knot = 1 nautical mile per hour = 1.852 km/h

1 km/h = 0.54 kt

0-7-2 Distance

1 nm (nautical mile) = 1.852 km

1 km = 0.54 nm

1 (statute) mile = 1.609 km

1 km = 0.621 (statute) mile

1 ft = 0.305 m

1 m = 3.281 ft

0-7-3 Mass

1 lb = 0.454 kg

1 kg = 2.205 lbs

0-7-4 Volume

1 US gallon = 3.785 liter

1 l = 0.264 USG

0-7-5 Volume/Mass Relation

For Aviation fuel: 1 US gallon = approx. 6 lbs

For Jet A fuel: 1 US gallon = approx. 6.84 lbs

0-7-6 Pressure

1 in.Hg = 33.864 hPa = 0.491 psi

1 psi = 68.948 hPa = 2.036 in.Hg

1 hPa = 0.0145 psi = 0.0295 in.Hg

1 mb = 1 hPa

0-7-7 Temperature

°C = (°F - 32) / 1.8

°F = °C * 1.8 + 32

1 Limitations

1-1 GENERAL

This section provides the operating limitations and instrument markings for the AL250 MPG3 flight model.

1-2 AIRSPEED LIMITATIONS FOR SAFE OPERATION

Stall speed (wings level, maximum mass)
- Flaps UP ..... 58 KIAS
- Flaps TO/APPR ..... 56 KIAS
- Flaps LAND ..... 53 KIAS

V_{NE} — Never Exceed Speed ..... 190 KIAS

V_{NO} — Normal Operating Speed ..... 149 KIAS

V_A — Design Manoeuvring Speed
- At 2750 lbs. G. W. ..... 121 KIAS
- At 1863 lbs. G. W. ..... 96 KIAS

V_{FE} — Maximum Flaps Extended Speed ..... 108 KIAS

Maximum Landing Gear Extension Speed ..... 130 KIAS

Maximum Landing Gear Retraction Speed ..... 109 KIAS

V_{LE} — Maximum Landing Gear Extended Speed ..... 130 KIAS

Best rate of climb speed
- gear up, flaps up ..... 87 KIAS
- gear down, flaps up ..... 76 KIAS

Best angle of climb speed
- gear up, flaps up ..... 77 KIAS
- gear down, flaps up ..... 70 KIAS

Turbulent air operating speed ..... 121 KIAS

Landing final approach speed (flaps LAND) ..... 74 KIAS

Maximum demonstrated crosswind velocity ..... 17 KIAS

Best glide speed ..... 82 kt

1-3 AIRSPEED INDICATOR MARKERS

White arc (Flaps Extended Range) ..... 53 - 108 kt
Green arc (Normal Operating Range) ..... 58 - 149 kt
Yellow arc (Caution Range - smooth air only) ..... 149 - 190 kt
Red radial (Never Exceed Speed) ..... 190 kt

Figure 1.1: Airspeed Indicator

1-4 POWER PLANT LIMITATIONS

1-4-1 ENGINE

Number of engines 1
Maximum take-off power (5 min max.) ..... 200 bhp
Maximum take-off engine speed (5 min max.) ..... 2700 rpm
Maximum continuous power ..... 196 bhp
Maximum continuous engine speed ..... 2650 rpm

1-4-2 FUEL

Fuel quality ..... Avgas 100/100LL
Total capacity ..... 77 US gal (292 l)
Total usable fuel ..... 72 US gal (273 l)
Fuel pressure:

Minimum . . . . . 14 psi (0.96 bar)
Maximum . . . . . 45 psi (31 bar)

1-4-3 OIL

Minimum pressure . . . . . 25 psi (1.72 bar)
Maximum pressure . . . . . 100 psi (6.9 bar)
Maximum temperature . . . . . 245°F

1-4-4 POWER PLANT INSTRUMENT MARKINGS

	Red Line (Minimum)	Green Arc Normal Op. Range	Yellow Arc Caution Range	Red Line (Maximum)
Tachometer		500 - 2700 rpm	1650 - 2200 rpm	2700 rpm
Oil Temp.		75 - 245°F	245°F	
Oil Pressure	25 psi	60 - 90 psi	idle: 25 - 60 psi ground warm up: 90 - 100 psi	100 psi
Fuel Pressure	14 psi	14 - 45 psi		45 psi

Table 1.1: Power Plant Instrument Markings

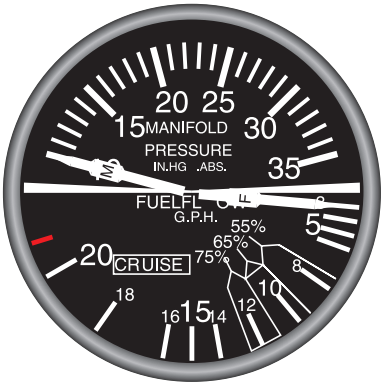

Figure 1.2: Fuel Flow Indicator

Figure 1.3: Tachometer

Figure 1.4: Oil Temperature

Figure 1.5: Oil Pressure

1-5 WEIGHT LIMITS

Maximum weight . . . . . 2750 lbs

1-6 CENTRE OF GRAVITY LIMITS

The centre of gravity of the ALSIM AL250 is variable within a range of 0% to 100% (0% is maximum forward CG and 100% is maximum aft CG).

1-7 MANOEUVRE LIMITS

This is a normal category aircraft. No acrobatic manoeuvres (including spins) approved.

1-8 EQUIPMENT AND SYSTEM LIMITATIONS

1-8-1 AUTOMATIC PILOT

The AL250 is equipped with an ALSIM autopilot.

- During autopilot operation, the pilot must be seated at the controls.
- The autopilot must be disabled for take-off, landing, and in approach below 200 ft AGL.
- The minimum height for autopilot engagement during climb or cruise is 1000 ft AGL.
- Autopilot (APR mode) approaches in category 1 conditions are approved until 200ft AGL.
- Use of pitch trim with autopilot engaged is prohibited and will disconnect the autopilot.
- Maximum operating speed . . . . . 175 kt
- Maximum fuel dissymmetry . . . . . 20 gal

1-8-2 COMMUNICATION

The avionics master switch must be OFF before connection to a ground power unit.

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2 Normal Procedures

2-1 GENERAL

The checklists presented in this chapter are for a **Generic Single Piston Engined Aircraft** flight model installed on the ALSIM AL250.

NOTE
These checklists cannot replace qualified flight instruction.

2-2 CABIN INSPECTION

BATTERY ..... OFF
ALTERNATOR ..... OFF
FUEL PUMP ..... OFF
MAGNETOS ..... OFF
CARBURETOR HEAT ..... OFF
PITOT HEAT ..... OFF
ALL DE-ICE ..... OFF
GEAR SELECTOR ..... DOWN
EMERGENCY GEAR ..... SECURED
AVIONICS MASTER ..... OFF
FLAPS ..... UP
BREAKERS ..... CHECKED
PARKING BRAKE ..... APPLY
ALL TRIMS ..... NEUTRAL
POWER LEVER ..... IDLE
PROPELLER LEVER ..... MAX RPM
MIXTURE LEVER ..... CUT OFF
FUEL SELECTOR ..... OPEN
ALL LIGHTS ..... OFF

2-3 START UP

BATTERY ..... ON
FUEL TANK ..... CHECKED
PARKING BRAKE ..... ON
MAGNETOS ..... ON
STROBE ..... ON
POWER LEVER 1/4
PROPELLER LEVER ..... MAX RPM
MIXTURE LEVER ..... FULL RICH
FUEL PUMP ..... ON
OUTSIDE SAFETY ..... CHECKED
STARTER ..... ON

2-4 AFTER START UP

OIL PRESSURE ..... CHECKED
ALTERNATOR ..... ON AND CHECKED
FUEL PUMP ..... OFF
AVIONICS MASTER ..... ON
SPEED BUGS ..... SET
ALTIMETER BUG ..... TOSA
ELECTRIC TRIM ..... CHECKED AND SET
NAV AIDS ..... SET
FUEL SELECTOR ..... ON
BREAKERS ..... CHECKED
SEAT BELTS ..... ON AND FASTENED

2-5 TAXI

BLOCK TIME ..... NOTED
TAXI LIGHT ..... ON
OUTSIDE SAFETY ..... CHECKED
BRAKES ..... LEFT AND RIGHT CHECKED
GYRO CHECKED ..... COMPLETE

2-6 ENGINE CHECK

PARKING BRAKE ..... ON
TAXI LIGHT ..... OFF
FUEL SELECTOR ..... FULLEST TANK
ENGINE PARAMETERS ..... CHECKED
ENGINE CHECK ..... CARRIED OUT
(At 2000 rpm: Magnetos checked - prop test X2, carburetor heat test minimum decreased 50 RPM/min, idle test and 1100 rpm/mn)

2-7 BEFORE LINE UP

LAND LIGHT ..... ON
ALTERNATOR ..... ON AND CHECKED
FUEL PUMP ..... ON
MAGNETOS ..... ON
PITOT HEAT ..... ON REQUEST
PROPELLER LEVER ..... MAX RPM
MIXTURE LEVER ..... FULL RICH
PITCH TRIM ..... SET
FLAPS ..... T/O
BREAKERS ..... CHECKED
NAV AIDS ..... SET
ALTIMETER BUGS ..... SET
FLIGHT CONTROLS ..... CHECKED
DEPARTURE DATA ..... CHECKED

2-8 AFTER TAKE OFF

LANDING GEAR ..... UP AND LOCKED
FLAPS ..... UP
CLIMB POWER ..... 25"/2500 RPM
ENGINE PARAMETERS ..... SET
LANDING LIGHT ..... OFF
ALTIMETERS ..... SET AND CHECKED

2-9 CRUISE

CRUISE PARAMETERS ..... SET
ENGINE PARAMETERS ..... CHECKED
ALTIMETERS ..... SET
H.S.I ..... SET
FUEL SELECTOR ..... CHECKED

2-10 BEFORE DESCENT

ARRIVAL BRIEFING ..... CARRIED OUT
FUEL SELECTOR ..... SET
MIXTURE LEVER ..... SET
NAV AIDS ..... SET AND CHECKED
ALTIMETERS ..... SET

2-11 APPROACH OR DOWNWIND

LANDING LIGHT ..... ON
LANDING GEAR ..... DOWN / 3 GREENS
FLAPS ..... APPROACH
FUEL PUMP ..... ON
MIXTURE LEVER ..... FULL RICH
BRAKES ..... TESTED

2-12 BEFORE LANDING

PROPELLER LEVER ..... MAX RPM
MIXTURE LEVER ..... FULL RICH
FUEL PUMP ..... ON
LANDING LIGHT ..... ON
LANDING GEAR ..... DOWN / 3 GREENS
FLAPS ..... LANDING

2-13 RUNWAY VACATED

PITCH TRIM ..... NEUTRAL
FUEL PUMP ..... OFF
LANDING LIGHT ..... OFF
TAXI LIGHT ..... ON
PITOT HEAT ..... OFF
FLAPS ..... UP
SQUAWK ..... STAND-BY

2-14 SHUTDOWN AND APRON

PARKING BRAKE ..... ON
BLOCK TIME ..... NOTED
AVIONICS MASTER ..... OFF
TAXI LIGHT ..... OFF
ALTERNATOR ..... OFF
MIXTURE LEVER ..... CUT OFF
MAGNETOS ..... OFF
STROBE ..... OFF
BATTERY ..... OFF

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3 Abnormal and Emergency Procedures

3-1 GENERAL

The checklists presented in this chapter are for a **Generic Single Piston Engined Aircraft** flight model installed on the ALSIM AL250.

NOTE
The procedures described here are not a substitute for sound judgement and common sense. Neither can these checklists replace qualified flight instruction.

3-2 ENGINE

3-2-1 LOSS OF POWER DURING TAKE OFF

MIXTURE LEVER ..... FULL RICH
FUEL SELECTOR ..... OPPOSITE
FUEL PUMP ..... ON

3-2-2 LOSS OF POWER IN FLIGHT

FLIGHT PATH ..... CHECKED
SPEED ..... UNDERCONTROL

If you have time
CARBURETOR HEAT ..... FULL HOT
FUEL SELECTOR ..... OPPOSITE
MIXTURE LEVER ..... FULL RICH
FUEL PUMP ..... ON

If after that the power is back:
CARBURETOR HEAT ..... OFF
FUEL PUMP ..... OFF
POWER LEVER ..... SET

3-2-3 LOW FUEL PRESS

FUEL PUMP ..... ON
FUEL SELECTOR ..... OPPOSITE

As soon as the engine is running
POWER LEVER ..... SET
MIXTURE LEVER ..... SET
FUEL PUMP ..... OFF

Expect to divert to the nearest airfield

3-2-4 LOW OIL PRESS

POWER LEVER ..... REDUCE
OIL TEMP ..... CHECKED

If oil temperature increases
POWER LEVER ..... IDLE
MIXTURE LEVER ..... CUT OFF

APPLY "LANDING WITHOUT ENGINE", page 3-5

3-2-5 OIL TEMPERATURE HIGH

OIL PRESSURE ..... CHECKED

- If oil pressure decreases
  - Apply engine shut down
  - Apply landing without engine

If oil pressure is stable
MIXTURE LEVER ..... FULL RICH
CYLINDERS TEMPERATURE ..... CHECKED

3-2-6 RPM OVERSPEED

POWER LEVER ..... REDUCE
PROPELLER LEVER ..... ADJUST
SPEED ..... TO THE MINIMUM

Expect to land as soon as posssible

3-2-7 ALTERNATOR FAILURE

AMMETER ..... CHECKED
ELECTRIC LOAD ..... REDUCED
ALTERNATOR ..... OFF

Expect to land as soon as possible
Autonomy is 15 minutes

3-2-8 LANDING WITHOUT ENGINE

SPEED	97 kt
GEAR	AS REQUIRED BY TERRAIN
FLAPS	FULL
DOOR	UNLOCK
MAGNETOS	OFF
POWER LEVER	IDLE
MIXTURE LEVER	CUT OFF
BATTERY	OFF
FUEL SELECTOR	OFF

3-3 FIRE

3-3-1 ENGINE FIRE DURING START UP

POWER LEVER ..... IDLE
MIXTURE LEVER ..... CUT OFF
FUEL PUMP ..... OFF
FUEL SELECTOR ..... OFF

When the engine is OFF
MAGNETOS ..... OFF
BATTERY ..... OFF
PARK BRAKE ..... RELEASED
EMERGENCY EVACUATION ..... PERFORMED

3-3-2 ENGINE FIRE IN FLIGHT

FUEL SELECTOR ..... OFF
POWER LEVER ..... IDLE
MIXTURE LEVER ..... CUT OFF
CABIN HEAT ..... CLOSED
CABIN AIR ..... OPEN

EXPECT “LANDING WITHOUT ENGINE”, page 3-5

3-3-3 ELECTRIC FIRE

BATTERY ..... OFF
ALTERNATOR ..... OFF
CABIN HEAT ..... OFF
CABIN AIR ..... ON

Divert to nearest airfield

3-4 LANDING GEAR FAILURES

3-4-1 MANUAL EXTENSION OF LANDING GEAR

BREAKER ..... CHECKED
LANDING GEAR LIGHTS ..... CHECKED
SPEED ..... MAX 88 kt
BREAKER ..... OFF
LANDING GEAR SELECTOR ..... DOWN
MANUAL EXTENSION HANDLE ..... DOWN
3 GREENS ..... CHECKED

NOTE
After successful extension (three green lights), if the Landing Gear circuit breaker has been pulled, the centre red warning light will remain on.

3-4-2 LANDING GEAR UP LANDING

APPROACH ..... NORMAL
LANDING GEAR ..... UP

Just before touchdown
POWER LEVER ..... IDLE
PROPELLER LEVER ..... MAX RPM
MIXTURE LEVER ..... CUT OFF

3-5 SPIN RECOVERY

Intentional spins are prohibited.

THROTTLES ..... IDLE
RUDDER ..... FULL OPPOSITE TO DIRECTION OF SPIN
AILERONS ..... NEUTRAL
CONTROL WHEEL ..... FULL FORWARD
FLAPS ..... UP

When rotation has stopped.

RUDDER ..... NEUTRALIZE
CONTROL WHEEL ..... SMOOTH BACK PRESSURE TO RECOVER FROM DIVE

3-6 FLIGHT INSTRUMENTS

3-6-1 VACUUM PUMP FAILURE

AUTOPILOT(if engaged) ..... DISENGAGE
GYRO WARNING LIGHT ..... CHECK
LEFT/RIGHT VACUUM GAUGE SOURCE LIGHT ..... CHECK
ENGINE RPM ..... INCREASE
VACUUM GAUGE ..... (Normal range= 4.5" - 5.5" hg) MONITOR

USE BACKUP ATTITUDE INDICATOR

- *IF IN VMC ..... REMAIN AND LAND VFR*
- *IF IN IMC ..... OBTAIN ATC ASSISTANCE TO NEAREST VMC*

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4 Performance

FLIGHT PHASE			CONFIG		ENGINE		
	PITCH	IAS	GEAR	FLAPS	MP	RPM	MIXTURE
ROTATION	10	65-75	DOWN	10	29	2700	100%
VX	13	70	UP	0	29	2700	100%
VY	9	87	UP	0	29	2700	100%
CRUISE CLIMB	5	104	UP	0	25	2500	100%
CRUISE 75%	0	125	UP	0	24	2400	75%
DESCENT VNO	-3	148	UP	0	22	2400	100%
CRUISE DESCENT	- 2,5	130	UP	0	18	2400	100%
HOLD	1	105	UP	0	20	2400	100%
APPROACH DESCENT	-2	85	DOWN	10	15	2700	100%
FINAL 1,3 Vs0	-1	74	DOWN	40	15	2700	100%

Table 4.1: Complex SEP Performance Table

Service ceiling: 13,000 ft

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5 Cockpit Overview

5-1 COCKPIT FITTINGS

This section deals with lighting, seats, headsets and the flight deck of the cockpit.

5-1-1 LIGHTING

The cockpit is illuminated by a lighting module mounted directly above the flight deck. The lighting module is positioned as shown below.
The flight deck is also backlit.

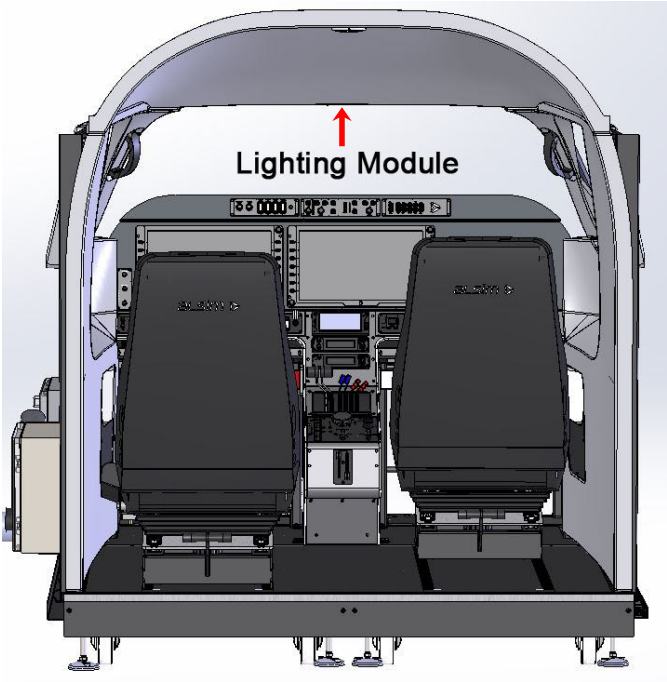


Figure 5.1: Cockpit Lighting

LIGHTING MODULE

Switch the lights on and off by pushing the button located at the side of the lighting module.

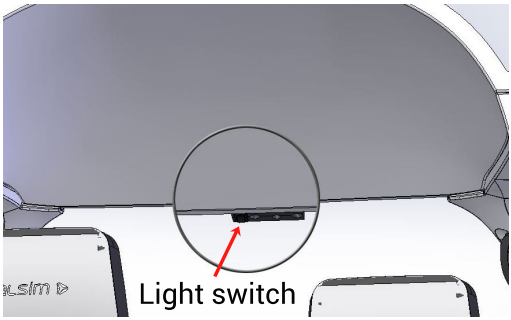


Figure 5.2: Light module

BACKLIGHT

The flight deck is also backlit. The backlight intensity can be adjusted using the Instruments Light control.

Figure 5.3: Instruments Light control

5-1-2 SEATS

The pilot and co-pilot seats can be adjusted as follows.

1. Back angle adjustment handle.
2. Fore and aft fine adjustment handle.
3. Full fore and aft slide handle.
4. Height (fore and aft) adjustment handle.
5. Full fore and aft slide handle.

NOTE
Before entry and exit, use the full fore and aft slide handles (3 & 5) to move the seat to the fully aft position. After entry (sitting), use the slide handle (3) to move the seat fully forward and then use the fine adjustment handle (2) as necessary.

SEATBELTS

Both seats of the trainer are equipped with lap belts.Insert the tongue into the buckle. Pushing the red quick-release button will free the tongue from the buckle.

5-1-3 HEADSETS

The trainer can be equipped with up to two optional headsets with microphones.

Figure 5.4: Headset

5-2 FLIGHT DECK

The flight deck consists of the pilot's flight deck and a central flight deck (with avionics and engine instruments).

5-2-1 PILOT'S FLIGHT DECK

Figure 5.5: Pilot's Flight Deck

5-2-2 CENTRAL FLIGHT DECK

Figure 5.6: Central Flight Deck

5-2-3 PEDESTAL

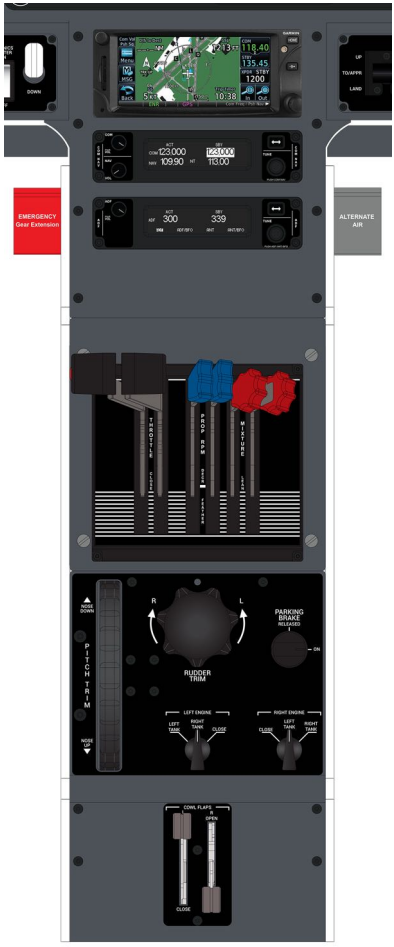


Figure 5.7: Pedestal

6 Aircraft Systems

6-1 FLIGHT CONTROLS

The flight control system consists of primary and secondary controls.

6-1-1 PRIMARY FLIGHT CONTROLS

The trainer is equipped with wheel, stick and pedals for the pilot and, as an option, the copilot. The systems are interconnected.

WHEEL

Turning the wheel controls roll (i. e. the simulated aircraft movement about the longitudinal axis).

On the wheel there are buttons for disconnecting the autopilot (red) and starting/ stopping/ resetting the stopwatch (black) as well the electric pitch trim switch. On the wheel back there is the PTT (push to talk) — the transmission switch for the communications system.

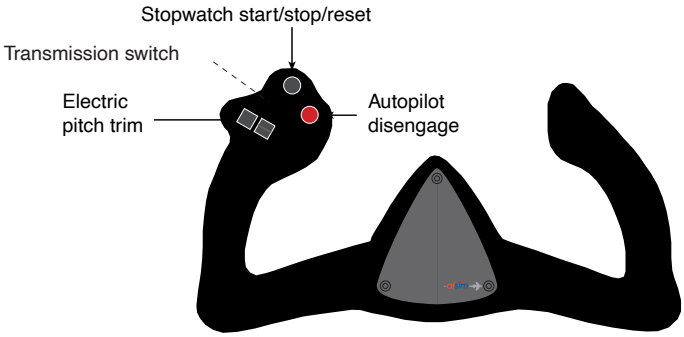


Figure 6.1: Pilot's wheel

STICK

Moving the stick fore and aft controls pitch (i. e. the simulated aircraft movement about the lateral axis). Pushing the stick forward lowers the simulated aircraft nose, pulling the wheel back raises it.

PEDALS

The pedals control the simulated aircraft rudder and thus its yaw (movement about the vertical axis) when the aircraft is in the air. On the ground the pedals control nose wheel steering.

The wheel brakes are activated by pressing the upper part of the pedal with one's toes.

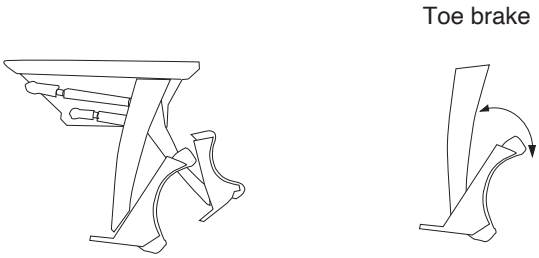


Figure 6.2: Pedals with toe brakes

6-1-2 SECONDARY FLIGHT CONTROLS

The secondary flight controls consist of pitch trim, rudder trim and the wing flaps.

The manual trim controls are located on the pedestal:

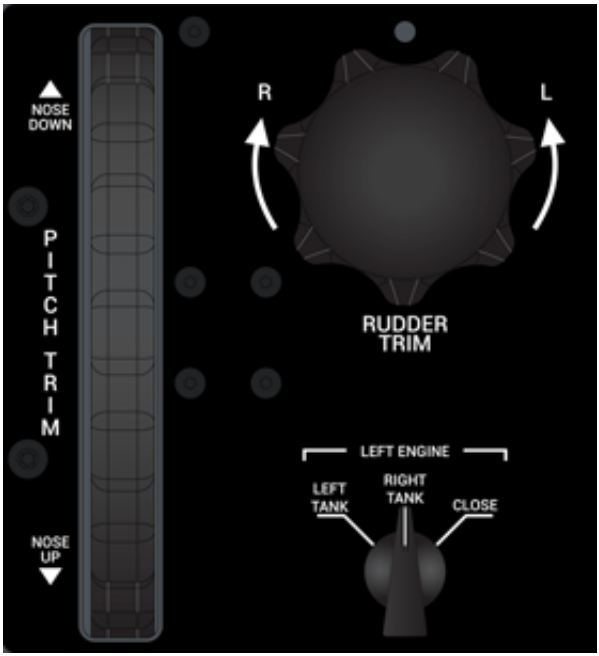


Figure 6.3: Manual trim controls

PITCH TRIM

Turn the wheel aft to increase the aircraft attitude (nose up) and vice versa.

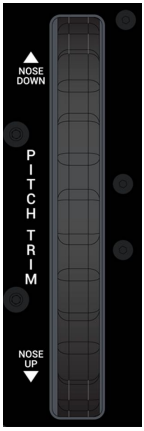


Figure 6.4: Pitch trim wheel

The electric pitch trim switch is on the wheel. Pushing both parts of the switch simultaneously forward has the same effect as turning the trim wheel forward and vice versa.

RUDDER TRIM

Turn the wheel to the right to trim the aircraft to the right and vice versa.

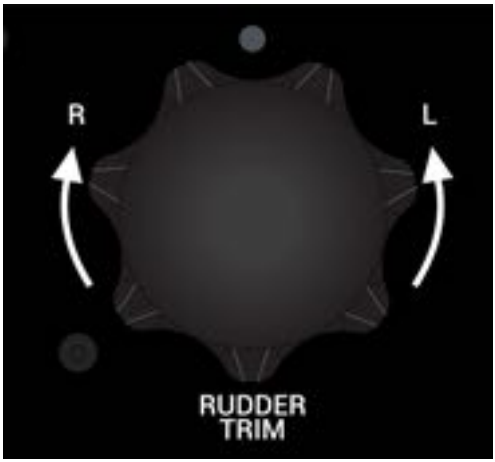


Figure 6.5: Rudder trim wheel

WING FLAPS

The flaps lever is located on the right side of central panel. There are three positions: UP, TO/APPROACH and DOWN which correspond to those indicated on the flaps indicator.

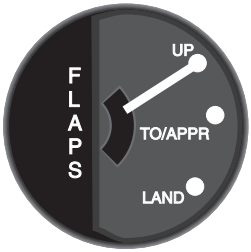


Figure 6.6: Flaps indicator

6-2 POWER PLANT

This chapter is not concerned with the type of engine and propeller installed on the aircraft being simulated, nor with how they function. This chapter only deals with how to actuate the controls and how to read the instruments in the trainer cockpit.

6-2-1 ENGINE AND PROPELLER CONTROLS

NOTE
For a single-piston engine flight model, the engine, propeller and mixture levers can be clipped together so that they function as one lever. If they are not clipped together, the left-hand levers are the active ones.

The power levers (black handles), propeller levers (blue handles) and mixture levers (red handles) are located on the pedestal. The left-hand levers control the left engine, the right-hand levers the right engine (not active on this flight model).

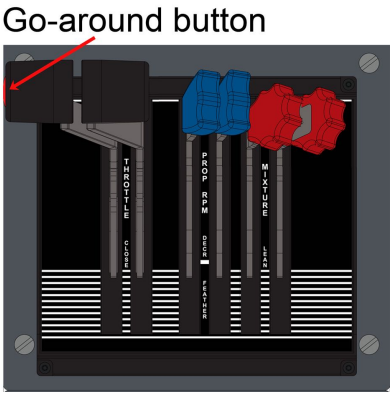


Figure 6.7: Power Plant Controls

Pushing the power levers forward increases the manifold pressure.

There is a go-around button on the side of the left power lever handle, pushing this button will:

- disengage the autopilot

- display the flight director guidance bars for a 7°-climb
- display 'GO AROUND' above the ADI.

Pushing the propeller levers forward increases the desired propeller RPM.

Pushing the mixture levers forward increases the richness of the mixture (more fuel, less air).

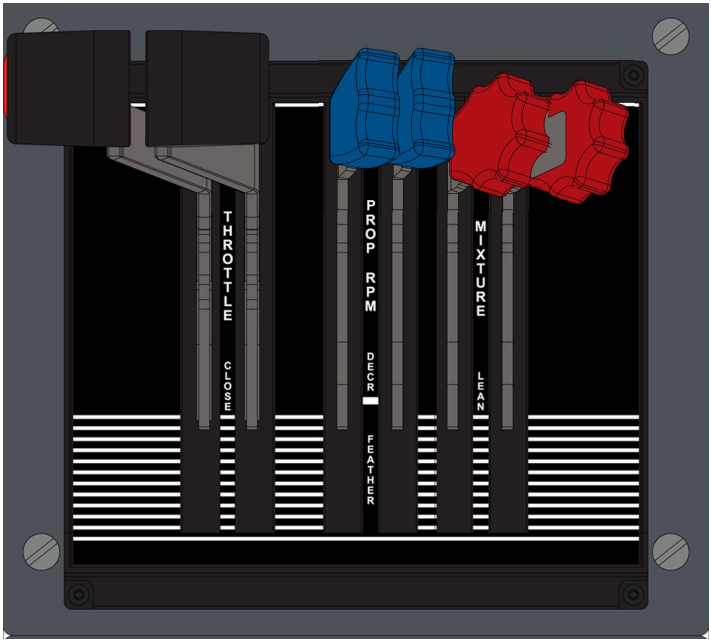


Figure 6.8: Power quadrant markings

The resistance of the levers can be adjusted by means of the friction control on the pedestal right-hand side panel: turning the wheel forward (=clockwise) will increase friction, turning it aft will reduce friction.

6-2-2 ENGINE COOLING AND HEATING CONTROLS

ALTERNATE AIR

In the event of power loss because of icing or blocking of the air filter, it is possible to alternatively draw air from the engine compartment. The Alternate Air lever is located under the instrument panel to the right of the center pedestal. To open the alternate air source, pull the lever towards the rear. In normal operation, the alternate air source is closed with the lever in the forward position.

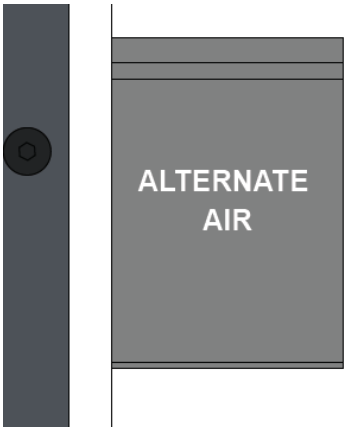


Figure 6.9: Alternate Air Lever

CARB HEAT

The Carb Heat knobs are located to the right of the pilot's wheel.

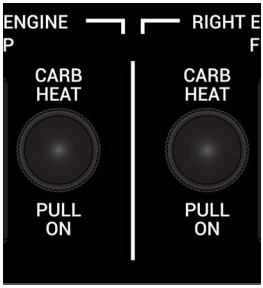


Figure 6.10: Carb Heat Knobs

NOTE
On the MPG3 flight model, the induction air temperature limitation cannot be exceeded with preheat.

NOTE
Only the left Carb Heat knob is functional on single engine flight models.

COWL FLAPS

The Cowl Flaps controls are located at the end of the pedestal.

NOTE
For training purposes, the cowl flaps are not generally intended for use with this flight model but can be used if desired.

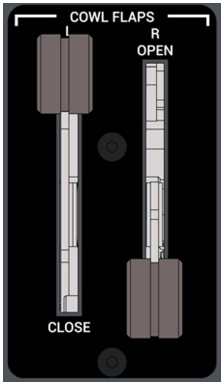


Figure 6.11: Cowl Flaps levers

6-2-3 ENGINE INSTRUMENTS

MANIFOLD PRESSURE/FUEL FLOW INDICATOR

This is a dual instrument.

On the upper half it shows the manifold pressure in inches of Mercury. The scale is graduated in increments of 1 from 10 to 35 with numerals at 10, 15, 20, 25, 30 and 35 in.Hg.

On the lower half the instrument shows the fuel flow in US gallons per hour. The scale has numerals at 0, 5, 8 (55%), 10 (65%), 12 (75%), 14, 15, 16, 18, 20. The maximum red radial line is at 21 gal/hr.

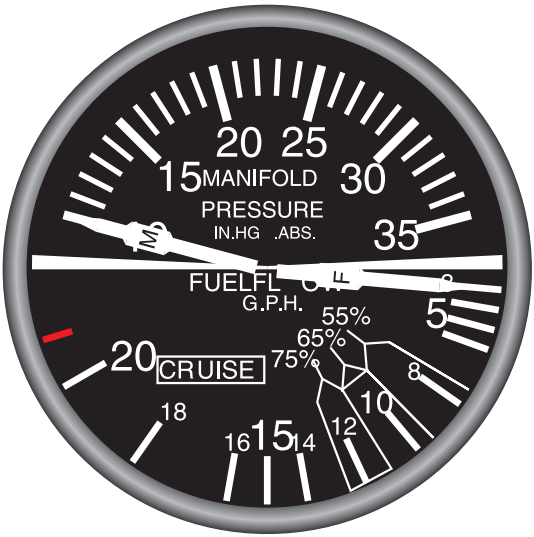


Figure 6.12: Manifold Pressure/Fuel Flow Indicator

TACHOMETER

The tachometer is graduated in increments of 100 from 300 to 3500 RPM with numerals at 300, 500, 1000, 1500, 2000, 2500, 3000 and 3500. The red radial line for maximum RPM is at 2700.

The Tachometer shows a green arc from 500 to 2700 rpm, a yellow arc from 1650 to 2200 rpm and a red radial line at 2700 rpm.

Figure 6.13: Tachometer

EGT INDICATOR

This scale is graduated in 25° Fahrenheit increments.

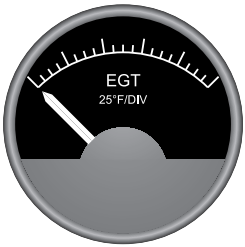


Figure 6.14: EGT Indicator

OIL PRESSURE INDICATOR

This instrument shows the oil pressure in PSI. The minimum pressure red radial line is at 25 psi, the first yellow caution range (idle) goes from 25 to 60 psi, the green arc from 60 to 90 psi, the second yellow caution range (ground warm-up) goes from 90 to 100 psi, and the maximum pressure red radial line is at 100 psi.

OIL TEMPERATURE INDICATOR

This instrument shows the oil temperature in °F. The green arc goes from 75 to 245°F and the maximum temperature red radial line is at 245°F.

FUEL PRESSURE INDICATOR

This instrument shows fuel pressure in PSI. The green arc is between 14 (red line minimum) and 45 (red line maximum) PSI.

6-3 STARTER

The starter switches and magneto rocker are located to the left of the pilot's wheel. Only the Left Engine switches are active on single engine flight models.

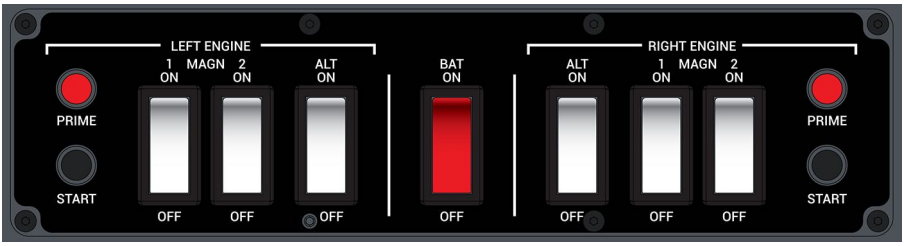


Figure 6.15: Starter

6-4 LANDING GEAR

6-4-1 NORMAL OPERATION

The landing gear control is located on the lower right-hand part of the pilot's deck.

Figure 6.16: Landing Gear Control

The landing gear lever needs to be pulled out from the flight deck before it can be raised or lowered.

The gear cannot be retracted on ground.

CAUTION
The landing gear lever is 'locked' by default and MUST be pulled OUT to release it before use. Failure to do so and/or trying to force it may break the lever mechanism.

ANNUNCIATORS

The landing gear annunciators are located at the lower left of the engine MFD.

Figure 6.17: Landing Gear Annunciatiors

The three green annunciators form a triangle. The right-hand light represents the right main gear, the left-hand light the left main gear, the top light the nose gear.

When none of the annunciators are lit, the landing gear is retracted. When three greens are lit, the landing gear is extended and locked. When the red warning light is lit, the gear is on its way up or down. The landing gear extension (or retraction) time should not exceed 7.5 seconds. If the red warning light located on the central flight deck stays lit longer, then:

- If no green light is lit, none of the gears are locked in the correct position.
- If one or two green lights are lit, only the gear(s) corresponding to the lights is (are) locked in the correct position.

GEAR WARNING SYSTEM

There is a gear warning horn which will sound and the red annunciator located on the central flight deck will blink when the gear is not down and locked and

- power is set to idle
- or/and the flaps are lowered

BREAKER

The landing gear system is protected by a breaker located on the breaker panel. If the breaker is disengaged, moving the gear lever will not move the landing gear.

6-4-2 EMERGENCY LANDING GEAR OPERATION

The emergency gear lever is located on the lower left part of the pedestal.

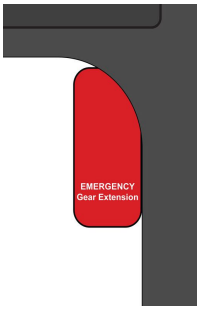


Figure 6.18: Emergency Gear Control

To operate:

1. Ensure that the main landing gear lever is down.
2. Pull the Landing Gear circuit breaker.
3. Lift the Emergency Gear lever.

NOTE
After successful extension (three green lights), with the Landing Gear circuit breaker pulled, the centre red warning light will remain on.

NOTE
The gear cannot be raised by means of the emergency gear lever.

6-4-3 WHEEL BRAKES

TOE BRAKES

The wheel brakes are activated by pressing the upper part of the pedal with one's toes.

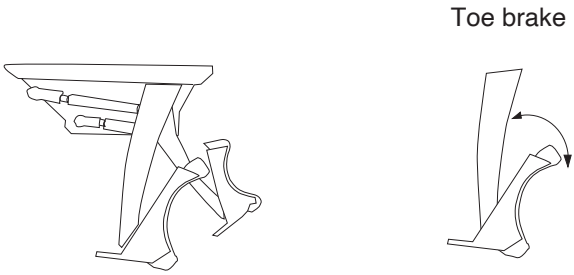


Figure 6.19: Pedals with toe brakes

PARKING BRAKE

The parking brake is located on the pedestal.

It is set by turning a quarter turn to the right (clock-wise) and released by turning a quarter turn to the left (anti-clockwise) - compare the markings on the pedestal.

Figure 6.20: Parking brake switch

6-5 FLIGHT INSTRUMENTS

6-5-1 AIRSPEED INDICATOR

The airspeed indicator shows the airspeed in knots. Its scale is graduated in 10-knot increments from 30 to 220. The green arc (normal operating range) goes from 70 to 150 knots. The yellow arc (caution range - smooth air only) goes from 150 to 187 knots, the white arc (flaps extended range) from 59 to 103 knots. There is one red radial at 187 knots to indicate the never exceed speed.

Figure 6.21: Airspeed Indicator

Three speed bugs can be set on the airspeed indicator. Switch between Speed Bug 1/2/3 thanks to the dedicated LSK then set the value wanted with the rotary function knob

6-5-2 VERTICAL SPEED INDICATOR

The vertical speed indicator has a graduated scale above and below a zero horizontal reference, in 100-ft increments, from zero to 2000 ft/min and -2000 ft/min

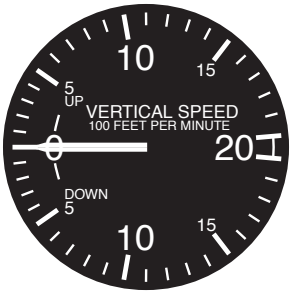


Figure 6.22: Vertical Speed Indicator

6-5-3 TURN AND BANK INDICATOR

The ball indicates sideslip (i. e. the aircraft longitudinal axis is not aligned with its heading), the aircraft symbol indicates direction and rate of bank. If the aircraft wing is aligned with one of the white markers next to 'L' or 'R', the turn is at the standard rate of 2 minutes for 360°.

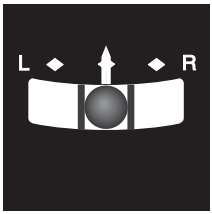


Figure 6.23: Turn and bank indicator

The annunciator light is green when the engine turns (as indicated by the tachometer) and red when the engine does not turn (engine off on the ground or propeller feathered in the air).

6-5-4 ALTIMETER

There are two altimeters installed: one on the pilot's panel, the second on the central panel.

The altimeter scale is graduated from 0 to 1,000 feet with increments of 20 feet. Altitude is displayed by means of three pointers. A long pointer (hundreds of feet), a short pointer (thousands of feet) and a triangle-tipped thin pointer (ten thousands of feet).

The left-hand window in the altimeter dial shows the air pressure in hPa, the right-hand window shows the air pressure in IN.Hg. The values in the windows can be adjusted by means of dedicated LSK associated with the rotary function knob.

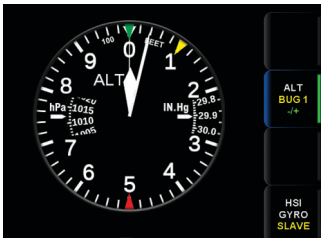


Figure 6.24: Altimeter

Three bugs can be set on the pilot's altimeter. Switch between Alti Bug 1/2/3 thanks to the dedicated LSK then set the value wanted with the rotary function knob

6-5-5 ATTITUDE INDICATOR

There are two attitude indicators installed: one on the pilot's panel, the other on the central panel

The roll attitude index on the instrument frame has fixed reference marks at 0° (white triangle), 10 and 20° (short white bar), 30°, 60° and 90° (long white bars). The white triangle at the instrument inside symbolizes the aircraft.

Pitch attitude marks are in five degree increments from 0 to 25 degrees. The aircraft is symbolized by either orange angles (cross-bars chosen in the Instructor Station 'Aircraft Menu') or an orange triangle (V-bars).

Figure 6.25: Attitude indicator in V-bars mode

Figure 6.26: Attitude indicator in crossbars mode

6-5-6 VACUUM GAUGE

The vacuum gauge is located on the central panel. It shows the pressure in the gyro suction system in units of in.Hg. with numerals at 4, 5, 6 in.Hg.

Figure 6.27: Vacuum Gauge

6-5-7 WARNING LIGHTS

There are four warning lights located on the PFD.

Figure 6.28: Warning Lights

When lit, they each indicate the following:

- **OIL:** Low oil pressure.
- **GYRO:** Vacuum pump failure.
- **ALT:** Alternator failure.
- **MSG:** GTN message received.

6-6 NAVIGATION INSTRUMENTS

6-6-1 RMI

Figure 6.29: RMI

The RMI comprises two needles (one single and one double yellow pointer) which can be set to indicate either a NDB or a VOR beacon by means of the two LSK buttons on the left side of the PFD.

The dedicated LSK button on the left-hand side will make the single needle point to a VOR or a NDB. A little arrow, located inside the instrument right over the button, will show which beacon the thin needle is indicating. If the VOR display is selected, then the single needle will indicate the information received by the NAV 1.

As well, the dedicated LSK button on the left-hand side will make the double needle point to a VOR or a NDB. A little arrow, located inside the instrument, right over the button, will show which beacon the double needle is indicating. If the VOR display is selected, then the double needle will indicate the information received by the NAV 2.

In case of a gyro failure — the RMI is driven by the gyro 1 — a red flag HDG will be displayed. When no valid frequency is received, the corresponding needle points to a 3 o'clock position.

6-6-2 EHSI

Figure 6.30: EHSI on PFD

1. Target HDG.
2. AutoPilot Heading pointer.
3. Course deviation scale.
4. Course arrow.
5. Current Heading: in degrees.
6. Course: in degrees.
7. DME data: ident, frequency and distance.

DME

The DME Line Select Key is used to determine the NAV receiver from which the DME display takes its information.

- NAV 1 shown: The displayed values are based on the beacon selected on NAV1.
- NAV 2 shown: The displayed values are based on the beacon selected on NAV2.
- Position HOLD: The DME display keeps the latest frequency selected (on NAV1 or on NAV2) in memory, and another frequency can be selected on the receiver. The display will still show the information transmitted on the frequency stored in memory.

6-6-3 GYRO SYSTEM

The trainer is equipped with a heading correction system on the PFD lower left side LSK button

Figure 6.31: Heading correction system, SLAVE mode

In normal operation the gyro switch will be 'SLAVE'.

In case of a failure of the Magnetic Flux valve, setting the LSK to 'FREE' will allow heading corrections on the HSI and RMI by means of the rotary function knob.

6-6-4 MAGNETIC COMPASS

Figure 6.32: Magnetic compass

The magnetic compass is located on the central panel. When the heading is changed suddenly, there will be a small delay until the magnetic compass shows the correct indication.

6-6-5 OBI

Figure 6.33: OBI

The heading select knob positions the compass card in order to find the heading to the selected VOR beacon or to find the runway axis (selected ILS) relative to the central vertical needle.

The lateral deviation indicator is driven by the NAV 2 receiver and indicates VOR or localizer deviation.

The glideslope deviation indicator is driven by the glideslope receiver (NAV 2), and indicates the aircraft position relative to the selected glideslope path. The pointer will be centered when the aircraft is on the glidepath beam, deflected up when the aircraft is below, and down when the aircraft is above the glidepath beam.

The TO/FROM indicator is driven by the NAV 2 receiver and indicates whether the aircraft is flying to or from a selected VOR station. It is represented on the instrument as a white triangle pointing up or down.

The maximum deflection of the needle will be 10° on both sides in VOR mode. In ILS mode the maximum deflection of the needle will be 2.5° on both sides for the localizer indication and 0.5° for the glide.

6-7 AVIONICS

For the systems to work the avionic master needs to be ON

Figure 6.34: Avionics Master Switch

NOTE
Refer to the diagram shown on figure 6.43 on page 6-46 to see the radios related to the Master Switch.

6-7-1 EFIS

The AL250 "electromechanical" instruments are adjustable via LSKs (Line Select Keys) and rotary settings knobs.

1. When you push the button corresponding to the function you want to use, the selected menu item becomes highlighted:

Color codes:

white coloured: function name (cannot be changed)

yellow coloured: selected parameter, you can change the parameter by using the button next to it:
Push the button to browse the list.
The last selected parameter becomes the active parameter.

green coloured: The selected parameter can be changed using the rotary knob below.

6-7-2 ALSIM ALA-500

The Alsim ALA-500 is an integrated GPS/NAV/COM/ADF/XPDR device, providing these features through a simple, user-friendly interface, helping the instructor to focus on the essence of pilot training. The ALA-500 has been designed to reduce the complexity and time consuming use of existing devices.

Figure 6.35: Alsim ALA-500

The ALA-500 is connected to the aircraft's avionics bus: Avionics Bus on SEPs and MEPs, and DC Bus on Turbo-Props and Turbo-Jets. Applying power to this bus will start the device, and cutting power will shut the device down, clearing all of its internal data, except Saved Routes.

Once switched on, the ALA-500 will start initializing, and display a loading screen. At the end of the initialization phase, a confirmation screen is shown, containing software and database version information for review by the crew prior to use the device in navigation conditions. A self-test procedure is executed at the end of the initialization phase to confirm proper communication between the ALA-500 and the other avionics components, such as the PFD. Once the self-test procedure is completed, pressing the Continue button will display the ALA-500 Home Page.

NOTE
See the ALA-500 Pilot's Guide for a complete description of the GPS NAV COM ADF XPDR.

6-7-3 GARMIN GTN 650

Available as an option, is an original Garmin GTN 650. The Garmin GTN 650 connects to the autopilot, but all information regarding the aircraft position and speed are received from ALSIM's flight model program. Therefore the GNS displays the current aircraft position at the same position as shown on the Instructor Station map.

Figure 6.36: Garmin GTN 650

The GNS turns on automatically when the power supply is available. When the self test has been completed, 'CONTINUE' (on screen) must be pushed twice to activate the GNS.

The GNS includes, amongst others, the NAV 1 and COM 1 functions and is also configured with XPDR functionality.

In VLOC mode the GNS works like a NAV receiver with actual existing beacons. In GPS mode, the autopilot can perform LPV and LNAV/VNAV SBAS approaches if the autopilot APPROACH mode is engaged, GPS signal quality and satellite geometry are appropriate for this flight phase:

- LPV: HAL = 0NM, VAL = 0m, HFOM <= 10m, VFOM <= 10m
- LNAV/VNAV: HAL = 0.3NM, VAL = 50m, HFOM <= 10m, VFOM <= 10m

NOTE
See the Garmin GTN 650 Pilot's Guide for a complete description of the GNS.

6-7-4 ADF

Figure 6.37: ALSIM ADF

The Alsim ADF consists of a digital display, one push button, a rotary OFF/ON switch, a volume control and a double encoder for frequency selection.

Push the Tune button to select between ADF, ANT or BFO and turn the Tune knob to the desired frequency.

Rotating the power switch clockwise from the OFF position switches the instrument ON and vice versa.

The arrows button switches between ACT and SBY values.

The Volume control can be used to adjust the audio volume of Morse Code IDENT signals.

ADF: In ADF mode the ADF is working and its display shows 'ADF'.

As the frequency display shows only 3 digits whereas NDB frequencies can use half kilohertz, an inaccuracy of +/- 0.5 kHz has been built into the system. Example: When the frequency 369 kHz has been selected, the following frequencies will be received: 368.5, 369 and 369.5. If more than one of these three frequencies should be within reception range, the closest will be chosen.

ANT: In ANT mode the RMI orange double needle points to '3 o'clock', indicating that the ADF is not working and the ADF display shows 'ANT'.

BFO: Does not work except for showing BFO in the display.

Frequency encoder: The outer knob, when turned clockwise, increases the frequency by 10 KHz, the inner knob by 1 KHz.

6-7-5 NAV/COM 2

Figure 6.38: ALSIM NAV/COM 2

The **ALSIM NAV/COM 2** combines a VHF communications transceiver (COM 2) with 200 channel VOR, Localizer and Glideslope receivers (NAV 2).

The **COM 2 radio** operates across the aviation voice band, in 8.33 kHz steps, from 118.000 to 136.975 MHz. Also, when connected to a position source, the nearest station identifier and type (e.g. 'LFRS TWR') will be displayed for the selected frequency.

The **NAV 2 receiver** operates from 108 MHz to 117.95 MHz decoding both the VHF Omni Range and Localizer navigation signals. The identifier will also be displayed for the selected frequency (e.g. 'NTS VOR').

When the localizer is tuned, the integrated Glideslope receiver automatically tunes the corresponding glideslope paired frequencies (328 MHz to 335 MHz).

The arrows button switches between ACT and SBY values.

Push the COM/NAV button to select between COM and NAV and turn the Tune knob to the desired frequency.

Rotating the PWR/VOL knob clockwise from the OFF position switches the instrument ON and vice versa. (The COM volume function is not active.)

The NAV VOL knob located in the bottom left corner of the bezel controls audio volume for the NAV radio.

6-7-6 MARKER ANNUNCIATORS

Figure 6.39: Marker annunciators

The marker annunciators are located on the pilot's PFD, just below the ADI.
The blue annunciator will be lit when the aircraft passes over an outer marker.
The amber annunciator will be lit when the aircraft passes over a middle marker.
The white annunciator will be lit when the aircraft passes over an inner marker.
The switches for the markers are the three switches located on the glareshield.

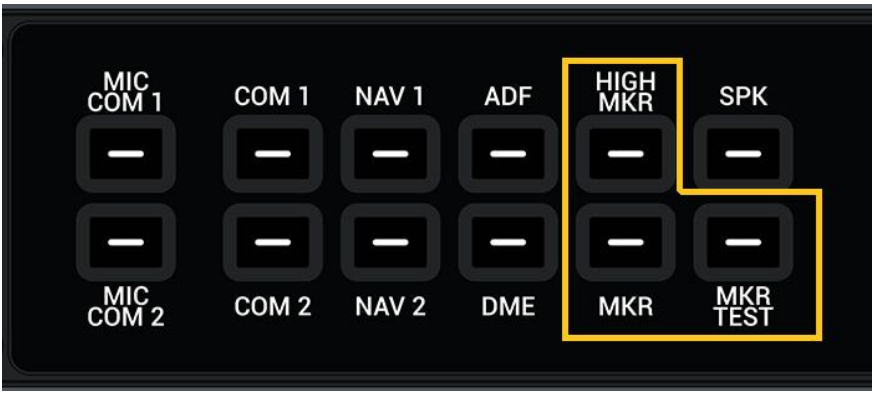


Figure 6.40: Marker switches

The marker morse code can be heard by setting the button 'MKR' On (lit).
The three marker button must be used as follows:

- MKR: the marker morse code can be heard over the station
- MKR HIGH:

  - On: considered as HIGH — the marker signal is received a short while before and after flying over the marker
  - Off: considered as LOW — the marker signal is only received when flying above the marker

- TEST: lights the marker lights

6-7-7 HEADSET CONNECTION

Communication between pilot(s) and/or instructor functions as in an aircraft, communication with air traffic control needs to be simulated with the flight instructor playing the ATC role. For details of how ALSIM software supports this simulation, please refer to the Instructor's Manual.

The intercom control panel is located to the left of the pilot's flight deck.

Figure 6.41: Intercom Control Panel

The headsets (x2) connector panel is located to the left and under the pilot's flight deck.

NOTE
For transmitting, the PTT (Push To Talk) switch on the back of the control wheel must be pushed down.

NOTE
The Internal Sounds volume control does not control the headset volume

6-7-8 AUDIO CONTROL

The audio control switches are located on the right of the FCP:

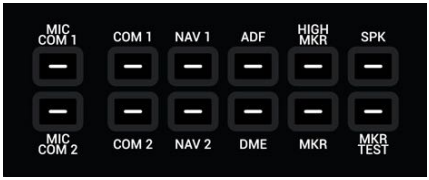


Figure 6.42: Audio Control Switches

From top to bottom, left to right:

- MIC COM 1 & 2: The messages are transmitted through the frequency selected on COM1 or COM2 — whichever is on/lit — (this is shown by a 'TX' that appears on related GNS, when a PTT switch is pushed). The light of the related button blink during the transmission.
- COM1: This button has no effect. (In an aircraft, with the switch on COM 1, the messages received on the COM 1 frequency could be heard.)
- COM2: This button has no effect. (In an aircraft, with the switch on COM 2, the messages received on the COM 2 frequency could be heard.)

  The next switches serve to choose which message or morse code is heard in the cockpit.

- NAV1: When set on NAV1 the morse code of the beacon selected on NAV1 can be heard.

> **NOTE**
> To hear the morse code, the IDENT function must be active on the GTN with an adequate volume setting.

- NAV2: When set on NAV2 the morse code of the beacon selected on NAV2 can be heard.
- ADF: When set on ADF the morse code of the beacon selected on the ADF can be heard.

- DME: the morse code of the beacon selected by means of the LSK DME button can be heard.
- SPK: This button has no effect. (In an aircraft, with the switch in position OFF, the messages or morse codes chosen with the next switches would be transmitted only in the headsets and not on the speakers.)

6-8 ELECTRICAL SYSTEM

6-8-1 OVERVIEW

The diagram below shows the simulated aircraft electrical system with breakers.

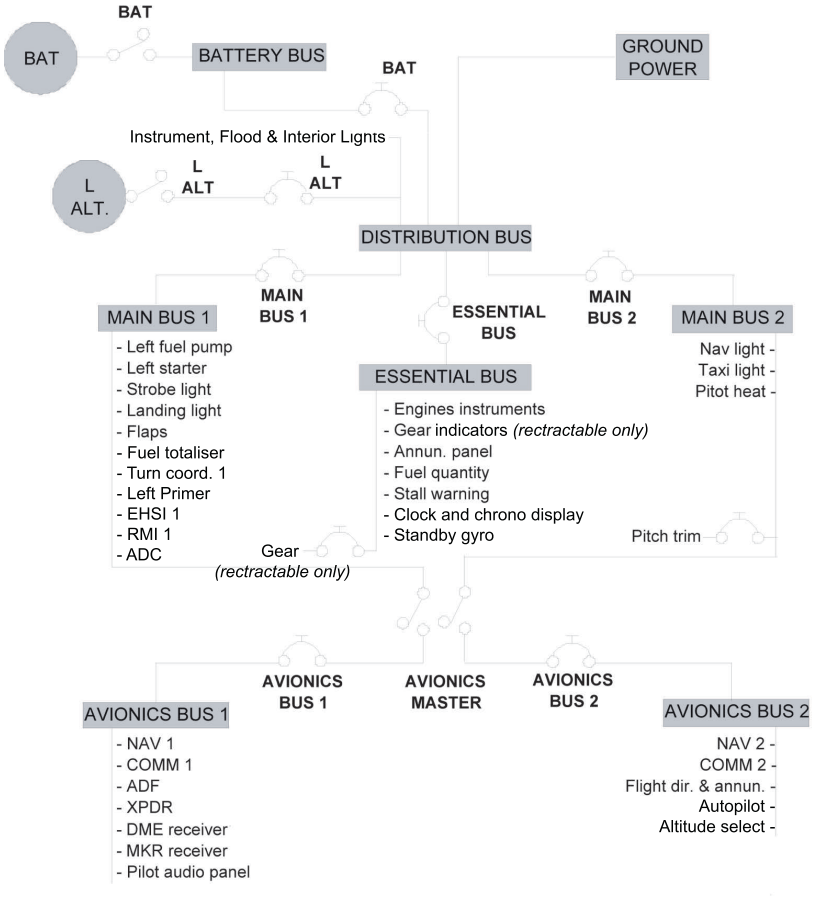


Figure 6.43: Diagram of the flight model simulated electrical system

6-8-2 BATTERY

The battery switch is a red two-position rocker switch to the left of the alternator switch. If the battery master switch is off and the engines are not running, the engine cannot start and all electric equipment is off.

In case of an alternator failure, or if the alternator is not switched on, the battery will be depleted after a few minutes, depending on current power consumption.

Connection of a ground power unit can be simulated by means of the Instructor Station (Aircraft Window).

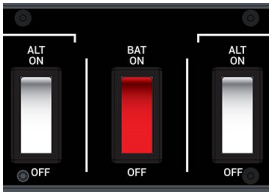


Figure 6.44: Electrical switches

6-8-3 ALTERNATOR AND AMMETER

The alternator switches are to the right and left of the battery master switch. Only the left-hand alternator switch is active. The ammeter is located on the central panel.

When the alternator is running, it will provide electric power to the aircraft systems and charge the battery if necessary. Recharging the battery takes approximately 5 minutes.

6-8-4 BREAKERS

The breaker panel is located on the cable chute, copilot side.

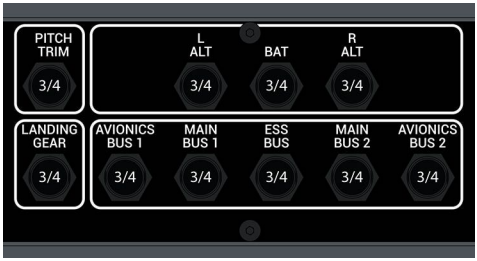


Figure 6.45: Breaker Panel

If you pull a breaker, the system protected by this breaker does no longer work. The following breakers are installed (from left to right, top to bottom):

- PITCH TRIM: Disables the electric pitch trim.
- L ALT: Left alternator disconnected from electrical system.
- BAT: Battery disconnected from Distribution bus.
- R ALT: not active on this flight model.
- LANDING GEAR: Gear motor disabled.
- AVIONICS BUS 1: Avionics bus 1 disconnected from Main bus 1.
- MAIN BUS 1: Main bus 1 disconnected from Distribution bus.
- ESS BUS: Essential bus disconnected from Distribution bus.
- MAIN BUS 2: Main bus 2 disconnected from Distribution bus.
- AVIONICS BUS 2: Avionics bus 2 disconnected from Main bus 2.

NOTE
Concerning Main, Essential & Avionics buses refer to the diagram on page on page 6-46 to see all functions related to the breaker.

Certain breakers can be made to pop by means of the Instructor Station Failure Window. You will find further details on this feature in the Instructor's Manual.

6-9 FUEL SYSTEM

The fuel system consists of the left and right tank which are monitored by one fuel quantity gauge each, the fuel selector switches and the electric fuel pump switches.

The fuel tanks are filled by means of the Instructor Station 'Aircraft Window'. The maximum amount depends on the chosen flight model and you will find it in the chapter 1 on page 1-1 in this manual.

6-9-1 FUEL QUANTITY INDICATOR

The fuel gauges on the central panel shows the amount of fuel in the tanks. The left-hand gauge indicates the fuel in the left tank, the right-hand gauge is for the right tank.

Figure 6.46: Fuel gauge

6-9-2 FUEL SELECTORS

The fuel selectors are 3 positions toggle switches located on the lower part of the copilot panel. Only the left selector is active on single piston engine flight models.

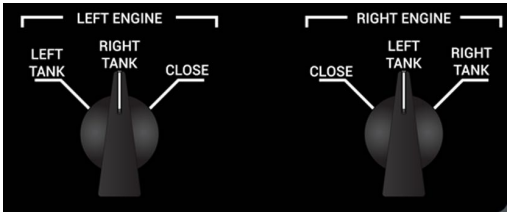


Figure 6.47: Fuel selectors

6-9-3 ELECTRIC FUEL PUMPS

To the right of the control wheel there are two switches for the auxiliary fuel pumps. Only the left switch is active on single piston engine flight models. When a fuel pump is running, a low humming sound can be heard and there will be a visible increase in fuel flow (only noticeable if the prior fuel flow was close to zero).

6-9-4 PRIMER BUTTONS

Pushing a primer button has the same effect as switching on the corresponding fuel pump (fuel flow will increase). Only the left switch is active on single piston engine flight models.

6-10 AUTOMATIC FLIGHT

The autopilot is a 2-axis system with flight director. The flight director can be active without the autopilot.

6-10-1 FLIGHT DIRECTOR

The flight director is engaged by means of the push buttons on the autopilot control panel situated on the FCP:

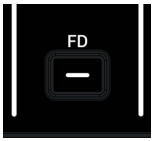


Figure 6.48: Flight director control button

The flight director offers visual information on the attitude indicator, which helps the pilot to guide the aircraft.

The flight director guidance bars can be displayed either as a cross or as an inverted V. Which mode is active depends on the setting in the Instructor Station 'Aircraft Window'.

Figure 6.49: Flight director in V-bars mode

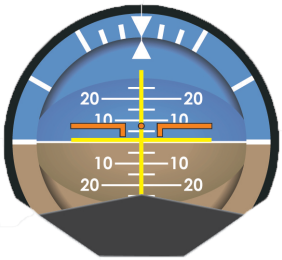


Figure 6.50: Flight director in cross-bars mode

6-10-2 FLIGHT DIRECTOR AND AUTOPILOT PANEL

The autopilot control panel is situated on the upper middle of the dashboard — FCP.

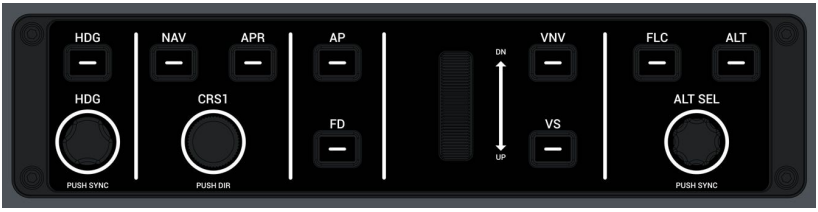


Figure 6.51: Autopilot panel

It consists of the following elements:

- **Rotary switch HDG**: It serves to set the heading select bug (the blue marker in position 'north' on the picture below) on the EHSI.

Figure 6.52: Electronic Horizontal Situation Indicator (EHSI)

- **AP button**: This button activates the autopilot (AP) as well as FD if it has not been active before. If no other mode is engaged, the AP will maintain the current pitch attitude and the wings level (if initial bank angle is <6°) or current aircraft bank angle (if initial bank angle is between 6° and 25°).

  Pushing the disconnect button on the wheel the first time disconnects the autopilot (pushing it a second time will disconnect the flight director as well).

  Pushing the electric pitch trim switches will also disconnect the autopilot, but leave flight director engaged.

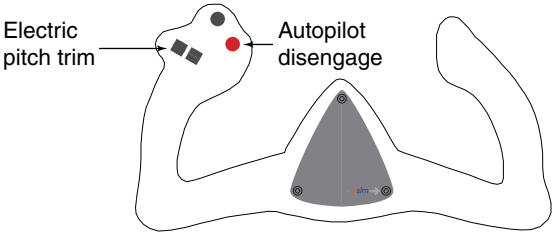


Figure 6.53: Controls on the wheel

- **Wheel DOWN/UP for the autopilot pitch wheel**: This switch allows you to change the aircraft pitch attitude with the autopilot engaged. As a consequence, any vertical modes (e.g. Altitude maintain (ALT), Vertical Speed (VS) or Indicate Airspeed (IAS) mode) is disengaged.
- **ALTITUDE SELECTOR button**: On the FCP, below the autopilot mode ALT, there is an altitude selector button:

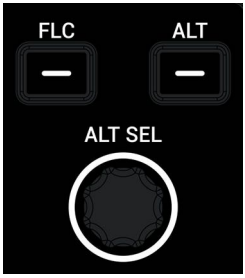


Figure 6.54: Altitude selector button

The altitude selected with the altitude selector button is displayed in digital form on the central panel:

Figure 6.55: Altitude selector display

In order to have the autopilot maintain the selected altitude, turn the altitude selector button until the display shows the desired value. Push the 'FLC' button to ARM the mode, 'ALT ARM' annunciator will illuminate in amber. Adjust the aircraft pitch attitude in such a way that it aims toward the selected altitude. When the selected altitude is reached, the aircraft will level out and remain at this altitude. The 'ALT HOLD' annunciator will be lit in green.

There are the following aural warnings:

- When climbing, at 1,000 feet under the selected altitude.
- At 150 feet above the selected altitude.
- When descending, at 150 feet under the selected altitude.

- **FD button**: This button activates the Flight Director.

  Pushing the disconnect button on the wheel a second time will disconnect the flight director as well.(pushing it the first time disconnects only the autopilot)

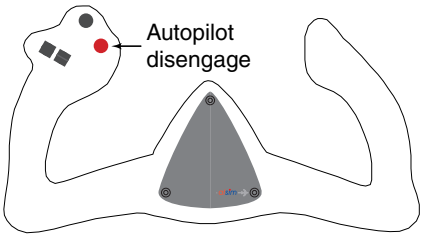


Figure 6.56: Autopilot disconnect button on the wheel

- **YD button**: not implemented in MPG3 flight model.
- **VS button**: This mode maintains the vertical speed which you have set either manually. The autopilot will maintain the vertical speed at which the aircraft is when VS mode is engaged.
- **ALT button**: In altitude maintain mode the autopilot keeps the aircraft on its current altitude. Whatever the aircraft is climbing, descending or in level flight, the autopilot will capture and maintain the altitude at which the aircraft is when ALT mode is engaged.
- **IAS button**: The autopilot maintains the aircraft current speed (the aircraft speed at the moment of IAS mode engagement).
- **FLC button**: Flight Level Change — pushing the button, Arm the ALT mode which captured the altitude selected with the altitude selector when going toward (climbing or descending).
- **Annunciator Panel**: When one of the modes is being engaged, an aural signal will sound. When a mode is active, the corresponding push button on the FCP is illuminated and there will be an indicator above the attitude indicator.
- **HDG button**: In heading select mode the autopilot searches and follows the heading set with the orange heading bug on the HSI. To use heading select mode, set the heading bug to the desired heading, then engage AP (if not yet active) and HDG. You can also set the bug with the AP engaged.

- **VNAV button**: not implemented in MPG3 flight model.
- **Rotary CRS/TRK HSI 1-2**: select the courses position the course selector on the HSI 1 and 2
- **APR button** (GNS CDI in VLOC mode): In approach mode the autopilot follows an ILS localizer and glideslope. Use it as follows:

  1. Set the aircraft on a course that intercepts localizer and glideslope.
  2. Set the ILS frequency on one of the NAVs and verify that the autopilot is connected to the HSI which is connected to this NAV.
  3. Activate AP and APR. APR ARMED will illuminate while the aircraft is not on the ILS.
  4. When the localizer has been captured, HDG will disengage (if engaged before), APR ARMED will disappear and APR CPLD will illuminate.
  5. When the glideslope has been captured, ALT will disengage (if engaged before), GS CPLD will illuminate.
  6. Disconnect the autopilot at 200 feet AGL.

NOTE
Be careful, when you engage APR mode, if ALT ARM mode is already engaged, it will be deactivated by the GS ARM mode.

- **APR button** (GNS CDI in GPS mode): In approach mode the autopilot follows an LPV or LNAV+V GPS approach. Use it as follows:

  1. Load and activate a GPS approach procedure in the current flight plan.
  2. Set the aircraft on a course that intercepts the approach desired track and glideslope.
  3. Verify that the autopilot is connected to the HSI which is connected to this approach.
  4. Set manually the HSI course pointer to the approach course value.
  5. Activate AP and NAV. NAV CPLD will illuminate.
  6. When the aircraft is align with the approach path, activate APR mode. LOC CPLD and GS ARMED will illuminate.

7. When the glideslope has been captured, ALT will disengage (if engaged before), GS CPLD will illuminate.
8. Disconnect the autopilot when minimums are reached.

NOTE
GPS approaches with vertical guidance require a SBAS compatible GPS unit, such as a GTN650.

NOTE
Don't forget to monitor GPS unit messages during approach. A precision approach can be downgraded to a non-precision approach if GPS signal integrity is lost.

NOTE
When aircraft is performing a GPS approach, it is possible to activate the missed approach procedure by pushing go-around buttons. Autopilot can follow the missed approach procedure if AP and NAV modes are selected.

- **NAV button** (GNS CDI in VLOC mode): In NAV mode the autopilot follows a VOR or GPS signal. Use it as follows:

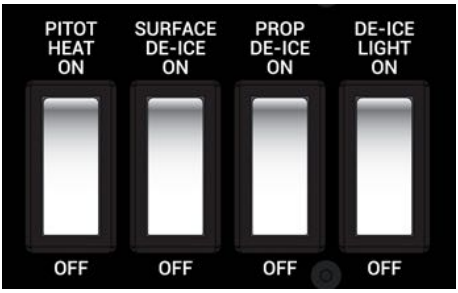
  1. Set the VOR frequency on one of the NAVs and verify that the autopilot is connected to the HSI which is connected to this NAV.
  2. Search the VOR by means of the course pointer on the HSI and set the heading bug in the desired position.
  3. Engage the AP, mode HDG and NAV. NAV ARM will illuminate.
  4. When the VOR signal has been captured, HDG disengages (if engaged before), NAV ARM will disappear and NAV CPLD illuminate.

- **NAV button** (GNS CDI in GPS mode): In NAV mode the autopilot follows a GPS flight plan. Use it as follows:

1. Enter the desired flight plan and activate a leg between two waypoints. Then verify that the autopilot is connected to the HSI which is connected to this flight plan.
2. Set manually the HSI course pointer to the current desired track value.
3. Engage the AP, mode NAV. NAV CPLD will illuminate.
4. Autopilot will follow automatically each flight points inserted in current flight plan.

6-11 ICE PROTECTION

The ice protection system on this flight model consists of a two-position rocker switch for PITOT HEAT.



Switching on the pitot heat will increase the alternator load as shown by the ammeter.

NOTE
Surface de-ice, Propeller de-ice and de-ice Light are not available with this flight model.

6-11-1 ALTERNATE STATIC VALVE

In the event of a failure of the Pitot static system (due to blocking, possibly with ice), the static pressure in the cabin can alternatively be used as the static pressure source. The Alternate Static Valve control is located below the instrument panel to the lower left of the left-side pilot's control wheel. Rotating the valve to point towards the pilot allows the static source to be taken from inside the cabin.

Figure 6.57: Alternate Static Valve Control

6-12 LIGHTS

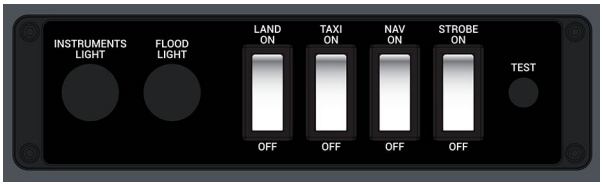


Figure 6.58: Light switches on the dashboard

The following light switches are located on the left-hand side of the dashboard:

- Landing lights
- Taxi lights
- Navigation lights
- Strobe lights

The position of the light switches influences not only the simulated aircraft electrical requirements but also the visual system outside, except for the navigation lights.

6-13 MISCELLANEOUS INSTRUMENTS

6-13-1 CLOCK AND STOPWATCH

There is a clock and stopwatch on the pilot's display panel.

Figure 6.59: Clock and stopwatch

In order to set the time:

1. Push the 'Chrono Time' LSK to activate it

Figure 6.60: Bug selector switch

2. Turn the rotary function switch until the clock shows the correct time

The stop watch is controlled by pressing the button on the wheel (see picture below)

- once to start the stopwatch
- a second time to stop the stopwatch
- a third time to reset the stopwatch to zero

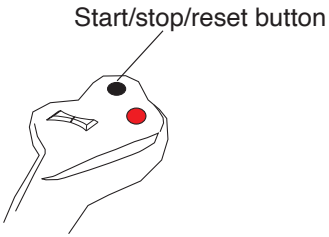


Figure 6.61: Stopwatch start/stop/reset button on pilot's wheel

The button on the pilot's wheel controls the stopwatch.

6-13-2 THERMOMETER

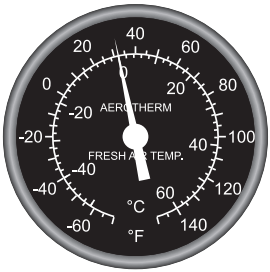


Figure 6.62: OAT thermometer

The thermometer shows the outside air temperature in degrees Fahrenheit and Celsius. The indicated value is calculated using the setting on the Instructor Station 'Weather Window' (which is the temperature at sea level) and the current altitude.

6-13-3 REGISTRATION PLATE

The registration number plate located on the central flight deck can be customised.

Figure 6.63: Registration Plate

On the Instructor Station Aircraft page, just type the desired text into the text field and it will appear on the central flight deck.

Figure 6.64: Instructor Station Registration Text Entry