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FLIGHT MANUAL

IRIS G115E / TUTOR T.1

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FOREWORD

AUTHORITY

Users are to regard this Flight Manual as an authoritative publication. It is compiled from data available from operating, technical, manufacturing and safety sources, and represents the best level of information available. These instructions provide you with a general knowledge of the simulated aircraft, its characteristics, and specific normal and emergency operating procedures. Instructions in this manual are for a pilot inexperienced in the operation of the simulation aircraft.

APPLICABILITY

This Flight Manual applies to the *IRIS G115E / Tutor T.1 product by IRIS Simulations Pty Ltd for both Microsoft Flight Simulator*.

Under **NO** circumstances is it intended to replace any form of real world training materials. The intended use is for educational and entertainment purposes. Should you require use for commercial or military applications, please contact admin@irissimulations.com.au to discuss your particular requirements.

OPERATING INSTRUCTIONS

This manual provides the best possible operating instructions, however, on occasions these instructions may prove to be a poor substitute for sound judgment. Multiple emergencies, adverse weather, terrain and other considerations may require modification of the procedure.

PERMISSIBLE OPERATIONS

The Flight Manual takes a 'positive approach' and normally states only what you can do. Unusual operations and configurations are prohibited unless specifically covered herein.

AMENDMENT ACTION

To assist in the maintaining of this publication in an up-to-date condition, users are to bring to the notice of IRIS Flight Simulation Software, any errors, omissions or suggestions for improvement. This should be done via e-mail to help@irissimulations.com.au or our Facebook page at www.facebook.com/irissimulations

WARNINGS, CAUTIONS AND NOTES

The following definitions apply to 'Warnings', 'Cautions' and 'Notes' found throughout the manual.

WARNING

Operating procedures, techniques, etc., which may result in personal injury or loss of life if not carefully followed. For the purposes of this product, this would mean the end of the simulation session.

CAUTION

Operating procedures, techniques, etc., which may result in damage to equipment if not carefully followed. For the purposes of this product, this would mean the simulated damage to aircraft components possibly resulting in the end to the simulation session.

NOTE

Operating procedures, techniques, etc., which is considered essential to emphasize.

CONTROL AND IDENTIFICATION MARKINGS

The use of block capitals in the text, when identifying switches, controls etc. indicates the actual markings on that item.

AIRSPEEDS

All airspeeds quoted in this manual are 'indicated' unless otherwise stated.

PROCEDURAL STEPS

All procedures and checklists items are numbered sequentially with Arabic numerals.

USE OF THE FLIGHT MANUAL

The use the Flight Manual correctly, it is essential to understand the division of the manual into its sections and the subsequent division of the sections. Each section has a table of contents, and best use will be obtained from the Manual by becoming familiar with the table of contents for each section. The index enables easy reference to a particular topic or item by page number.

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CHAPTER 1

DESCRIPTION AND OPERATION - GENERAL

THE AIRCRAFT

Introduction

The IRIS G115E / Tutor T.1 is a fully aerobatic, single-engine light training aircraft having side-by-side seating for 2 crew members.

It consists of a semi-monocoque fuselage with a cantilevered wing, conventional empennage and it is constructed mainly from carbon fibre reinforced plastic (CRP).

The composite structure is protected from moisture and ultra-violet radiation by a polyester gelcoat, acrylic lacquer and an electro-conductive filler. This provides lightning strike protection and enables static electricity to be safely discharged.

Space for stowage of light baggage is available behind the seats.

IRIS G115E / Tutor T.1 General Arrangement

Gross Weight

The aircraft basic empty weight is approximately 1510 pounds. Maximum take-off gross weight is 2183 pounds.

These weights shall not be used for computing aircraft performance or for any type of operation.

Refer to *Section 3, Operating Limitations*, for take-off and landing weights.

Cockpit Arrangement

IRIS G115E / Tutor T.1 Instrument Panel

The cockpits are in a side by side arrangement with the instructor pilot sitting in the right seat, with the student in the left.

Solo flight is conducted from the right seat only.

Principle Dimensions and Statistics

Wing span	10.0m
Maximum length	7.54m
Maximum height	2.40m
Wing	
Aerofoil	Eppler E696
Wing area	12.21m2
Dihedral	5deg
Incidence	2deg
Ailerons	
Area	0.56m2
Flaps	
Area	1.15m2
Tailplane	
Aerofoil	NACA 64010
Span	3.50m2
Area	2.72m2
Elevator surface area	0.86m2
Fin	
Aerofoil	NACA 64009
Area	1.69m2
Rudder Area	0.64m2
Undercarriage	
Wheel track	2.56m
Wheel base	1.61m
Nose wheel	500 -5/6 PR
Main wheels	15 x 6.00 – 6
Power Plant	
Engine	Textron – Lycoming AEIO-360 B1F
Type	4-cylinder, horizontally opposed, air cooled, direct drive, fuel injected engine.
Displacement	361.0 cubic inches
Rated power	180 HP at 2700 RPM
Propeller	Hoffman HO-V343 KV/V183 GY 3-bladed composite, hydraulic operation, constant speeding, variable pitch.

Fuel System

Fuel type	Avgas 100/100LL
Wing tank capacity	2 x 75 litres
Collector tank capacity	5.4 litres
Useable fuel	143 litres

Landing Gear

Type	Tricycle, non-retractable
Main wheel pressure	44 PSI (3 bar)
Nose wheel pressure	36 PSI (2.5 bar)
Nose wheel steering range	47deg brake assisted.

Electrical System

Generator	28 volt nominal, 35 amp
Battery	24 volt, 10 ampere-hour, lead acid

ENGINE

Lycoming AEIO-360

The engine is a 4 cylinder, air cooled, direct drive, fuel-injected unit rated at 180 BHP at 2700 RPM.

Drives are provided for the following elements;

- Generator
- Propeller Governor
- Oil Pump
- Fuel Pump
- Two Magnetos

Exhaust gases are routed to 2 expansion chambers and then to the exterior via two pipes below the cowling.

The starboard expansion chamber has a heater jacket in which air, warmed by the exhaust gases is available for cockpit and windscreen heating.

The electric starter takes power from the main busbar. Power is supplied through a starter relay operated by the starter button.

A STARTER caption on the Caution Warning Panel which, when illuminated, indicates that power is supplied to the starter motor.

Air supply to the engine (induction air) is via a forward facing intake, which incorporates a filter element, in the engine bottom cowling.

IGNITION SYSTEM

The engine ignition system is independent of the aircraft electrical system except that the aircraft battery is needed for starting.

The system comprises the following components:

- Magnetos
- Spark Plugs
- Ignition Switch
- Start Button
- Spark Booster

During normal operation, the engine should be run with the magneto switch in the BOTH position. Operation in the left or right position will cause a loss of power.

CAUTION

If the STARTER caption remains illuminated after the release of the starter button, stop the engine and reload the aircraft.

ELECTRICAL SYSTEM

The aircraft uses a DC electrical system powered by either a 24 volt battery or an engine driven generator of 28 volt output.

The power is distributed through 4 busbars and most systems are protected by circuit breakers. The circuit breakers are arranged in busbar groups in the cockpit.

Battery

A 24 volt, 13.6 amp per hour battery is located behind the cockpit rear bulkhead on the right side of the fuselage.

A battery switch connects the battery to the Main busbar through a battery relay which also incorporates a ground supply relay that connects an external power supply to the Main busbar

The battery should provide power for 30 minutes after a generator failure provided that non-essential services are switched off. A LO VOLT caption warns of failure.

External Power

An external 24 volt power supply may be connected via a 3 pin socket located behind a flap on the fuselage right side near to the wing trailing edge.

Generator

A belt-driven generator is mounted at the front right of the engine. It provides a 28 volt output and a maximum load of 30 amps.

It is controlled manually by a three position switch with ON, OFF, and RESET positions.

A voltmeter and ammeter give indications of the power output and a GEN caption gives warning of failure. Circuit breakers protect the system.

Main Busbar

The Main busbar is supplied with power from the battery or the generator or an external supply on the ground. The Main busbar distributes power to the Essential busbar, Avionics 1 busbar, Avionics 2 busbar and other services directly.

Essential Busbar

The Essential busbar provides power to the minimum services deemed essential for the safe recovery of the aircraft.

Avionics 1 Busbar

The Avionics 1 busbar provides power to the minimum avionic services needed for the safe recovery of the aircraft.

Avionics 2 Busbar

The Avionics 2 busbar provides power to avionics not supplied by the Avionics 1 busbar.

Essential/Avionics 1 Switchover System

Power for the Essential and Avionics 1 busbars will automatically be supplied directly from the battery if the power on the Main busbar fails.

Voltmeter / Volt Indicator / LO VOLT

The voltmeter/volt indicator indicates the voltage on the Essential busbar. The LO VOLT caption on the CWP illuminates when the Essential busbar voltage is less than 25 ± 0.5 volts.

Ammeter / Amp Indicator

An ammeter/amp indicator shows the flow from the battery or external supply to the busbars; a negative charge shows battery discharge and a positive charge shows the generator charging the battery.

GENERAL EQUIPMENT

The aircraft is fitted with conventional dual flying controls consisting of a control column and rudder pedals at each crew position. The head of the column is fitted with a press-to-transmit (PTT) switch.

The control surfaces are mass and aerodynamically balanced and comprise of;

- **Ailerons.** Differential and Frise ailerons extend over the outer third of each wing trailing edge.
- **Elevators.** Elevators extend over the whole width of the tailplane trailing edge.
- **Rudder.** A rudder extends the full height of the fin.

Elevator Control

Fore and aft movement of a control column is transmitted to the elevators by a system of push-pull rods. The left elevator has an adjustable geared trim tab. Trim control is by a hand-wheel that protrudes through the upper surface of the centre pedestal aft of the engine controls. An adjacent indicator shows the amount of trim set.

Aileron Control

Lateral movement of either control column is transmitted to both ailerons by push-pull rods. The ailerons cannot be trimmed in flight but a trim tab, adjustable on the ground, is fitted to each aileron.

The aileron controls are connected to the rudder controls via a spring device in the centre console. Movement of the rudder or aileron controls will produce a complementary increase in control feedback force.

Rudder Control

The rudder pedals are connected to the rudder with a push-pull rod and to the nose wheel through a spring system.

Each set of pedals can be adjusted to suit pilot leg length via a wheel in the cockpit floor just forward of the seats; moving the wheel top to the right moves the pedals rearwards.

Attached to the top of each rudder is a wheel brake toe pad. The rudder cannot be trimmed in flight but it has a fixed tab which can be adjusted on the ground.

Flaps

A simple flap is fitted to the trailing edge of each wing between the aileron and the wing root walkway.

The two flaps are interconnected by push-pull rods and operated by a single, electrically driven, screw-jack mechanism. This minimizes the chance of asymmetric flap.

Actuator operation is controlled by a selector lever and micro-switches on the centre pedestal. The selector has gates for TAKE OFF (15° deflection), LAND (45°) and FULL (60°) but any position between UP and FULL may be selected.

Achieved flap position is shown by the adjacent indicator.

Stall Warning System

A stall warning system is fitted to give advanced warning of an approaching stall. The sensor, a vane set in the leading edge of the port wing, activates an audio warning approximately 5 to 10kts. before the stall.

Landing Gear

The landing gear comprises a non-retractable steerable nose wheel, two main wheels and fairings.

The struts of the main gear and gas strut of the nose gear provide shock absorption and the nose gear includes a conventional oil-filled shimmy damper to prevent nose wheel vibration.

All wheels have inner tubes and each main-wheel has a hydraulically actuated single disc brake.

The nose wheel will deflect ± 9 degrees with full rudder pedal deflection and can castor freely up to 47 degrees with application of differential wheel brake.

When towing the aircraft do not exceed 47 degrees nose wheel deflection or damage will occur to the nose gear.

Brakes

Each main wheel is fitted with hydraulic disc brakes and each pilot has a set of toe brake pedals.

Pressure is generated by the pilot pushing on the top of the rudder pedal. The left brake is controlled by the left brake pedal and the right brake is controlled by the right brake pedal. The brakes are progressive.

The harder you press, the harder the brakes are applied. Take care not to lock the wheel or the tyre could be damaged.

To set the parking brake, first slide the parking lever to the SET position and press both brake pedals until full resistance is felt; one moderate application of pressure is normally sufficient.

Further pressure to the wheel brakes can be supplied at any time by pressing down harder at the toe brakes. To Release the parking brake, first depress the toe brake pedals and hold, to ensure adequate pressure remains at the wheel brakes and then move the parking brake to RELEASE.

The toe brake pedals themselves can then be released as required to allow the aircraft to taxi forward.

Air Conditioning

The aircraft is unpressurised. Cockpit ventilation and windscreen demisting are achieved by introducing warm air from a heat exchanger or cold air from NACA ducts in both sides of the fuselage, just below the windscreen.

Air temperature and direction are controlled by 2 levers positioned under the instrument panel on the port side.

Access

The cockpit can be entered from either side via a walkway at each wing root. Care should be taken not to step on any area outside the marked walkway.

The canopy consists of a frame which slides on 3 rails and includes an overhead latch to lock it closed.

When closed a pin engages at the front and rear of each side rail to hold the canopy down.

Furnishing

The aircraft has two seats, each with a cushion and safety harness. The seats are not adjustable but sitting position may be varied by the use of cushions of differing thickness.

Each occupant may wear a back-type parachute.

The seat harness comprises a negative g restraining strap incorporating a quick-release fitting into which are plugged the two lap straps and two shoulder straps.

Simultaneous release of all straps is obtained by pressing the button and rotating the disc on the QRF through 45° in any direction. If the QRF fails to release, the straps may be severed by use of the escape hammer's cutting tool.

SAFETY EQUIPMENT

Emergency Locator Transmitter

The Artex ELT is a completely self-contained and self-powered unit mounted on the port side of the equipment compartment behind the baggage area, with a cockpit remote switch located on the right instrument panel.

The ELT, when activated, will transmit on 121.5MHz 3 times per second until the battery is depleted which at normal temperatures would be after at least 50 hours.

Simultaneously, for the first 24 hours of operation, it will transmit on 406.028 MHz once every 50 seconds; this transmission lasts for 440 ms and contains pre-programmed identification data.

Cockpit Fire Extinguisher

A hand-held Halon fire extinguisher is secured to the floor behind the port seat. A safety pin prevents inadvertent operation and the mounting allows removal with one hand.

The unit is discharged by squeezing the trigger on the operating head. It is primarily intended for use after a crash landing, however, if it is used in flight, due to the noxious nature of Halon, the cockpit should be ventilated immediately after operating the extinguisher and medical advice sought on landing.

Escape Hammer

A combined escape hammer and harness cutter is located on the left side of the centre console. If the canopy cannot be opened it can be smashed by using the carbide tip. The reverse end of the hammer incorporates the harness cutter that can be utilised if the harness cannot be released.

Emergency First-aid Kit

An Emergency First-aid Kit is secured to the port side of the baggage compartment floor.

Central Warning Panel

A central warning panel (CWP) is located above the main instrument panel. The CWP has captions as per the table below, a TEST button that illuminates all the captions when pressed, and a DAY/NIGHT switch that reduces the light output of the panel when required.

Caption	Colour	Trigger
LO VOLT	Red	Essential Busbar voltage less than 25 volts.
STARTER	Red	Power is being supplied to the starter motor.
FUEL	Red	The fuel quantity of the left or right tank is below 20% of capacity.
GEN	Red	The generator is not providing a power output
LO OIL	Red	The oil pressure is less than 21 psi.

AIRCRAFT LIGHTING

External Lighting

External lighting consists of navigation lighting, anti-collision lighting, high intensity strobe lighting and a landing lamp. All lighting controls are located on the Utility panel.

- **Navigation Lights**; A coloured navigation light is at each wingtip, red on the port side and green on the starboard. The wingtip units also incorporates rear facing white navigation lights.
- **Anti-Collision Lights**; A red anti-collision light is on the lower fuselage.
- **Strobe Lighting**; High intensity white strobe lights are fitted at each wing tip. Anti-dazzle plates are incorporated into the fittings.
- **Landing Light**; A landing light is installed in the lower part of the engine cowling.

Internal Lighting

Interior lighting consists of two systems; panel lights and instrument lights each supplied from different busbars.

Controls for both systems are on the Utility panel. The four panel lights are located on the underside of the coaming and power supply from the Main busbar is varied by a dimmer control.

An On/Off switch controls the instrument lights, which are powered from the Essential busbar. A dimmer control is provided for instruments without automatic brilliance control.

In addition to the above lighting, a map light on a "swan neck" mounting is available between the crew seats. A rotating knob on the Utilities Panel controls brilliance.

COMMUNICATIONS EQUIPMENT

Introduction

The IRIS G115E / Tutor T.1 communications installation consists of Bendix/King integrated equipment comprising a KMA 26 audio control system, a KTR 909 UHF transceiver, a KX 155A VHF NAV/COMM transceiver and a KT 73 transponder unit.

Each control column has a press-to-transmit (PTT) button and a mute switch is located towards the left end of the Utilities panel.

The switch incorporates an amber light that illuminates on activation. Selecting the mute switch reduces the volume of all incoming audio signals by 6 dB thus broadcasts may still be heard but at a reduced level.

The Mute does not affect the outgoing audio signal. Deselecting mute returns all volumes to the pre-set level.

Power is supplied to all the units via the Avionics 1 and 2 Busbars and associated circuit breakers.

Lighting levels on the units are either automatically controlled or adjusted using the dimmer control on the Utilities panel.

Bendix/King KMA 26 Audio Control System

The KMA 26 has a built-in 6 station intercom with 2 dedicated amplifiers. The unit is active as soon as the Avionic Master switch is selected on.

Intercom operation may be voice activated (VOX), where the intercom automatically becomes active when a crew member speaks or key activated, a function not supported on this aircraft.

The unit also incorporates a Marker Receiver.

There are 2 rows of audio source selection buttons each with an integral green light that illuminates on receiver selection. Normally, selection of a transmitter will automatically connect the appropriate receiver to the headphones. If necessary this can be followed up by pushing one of the audio buttons. Generally the buttons are used for selecting additional audio information, for example when identifying a navigation aid.

Pushing a button selects the audio source, pushing it again deselects it. Of the 10 selectable sources, COM 3, ADF, and AUX are unavailable. MONI will play back random radio chatter.

Bendix/King KTR 909 UHF Radio

The KTR 909 UHF transceiver provides two-way voice communications over the frequency range available in the simulation.

Manual frequency selection is achieved using the concentric, rotary controls on the right of the unit; the outer knob controls the frequency in 1 MHz steps, the inner controls the frequency in 25 KHz steps.

In both cases, clockwise rotation of the knobs increases the frequency. A wrap-around feature means the unit will roll to the other end of the frequency range as the controls are rotated.

Bendix/King KX155A VHF Radio

The KX 155A NAV/COMM transceiver provides independent VHF communications and VOR/ILS navigation facilities in one complete unit.

Operation of the NAV facility is covered later in this document. VHF communication is provided on 760 frequencies, from 118 to 136.975 MHz in 25 KHz increments, and can be operated with manual frequency selection.

Rotating the concentric frequency control, positioned just left of centre, selects a frequency in the STBY display. The outer control changes the MHz selection and the inner changes the KHz selection in 25 KHz steps.

A clockwise rotation increases the frequency and rotation of the control beyond the frequency limits wraps the display around to the other end of the frequency band.

Active and Pre-set modes are not simulated in this device.

Bendix/King KT 73 Transponder

The KT 73 is a panel mounted Transponder with Mode S Level 2 Datalink which offers a comprehensive functional and safety capability. It incorporates a gas-discharge display which can show current altitude, identification codes, flight or aircraft identification and test/fail information.

The unit is switched on by rotating the function selector, initially to FLT ID, then to SBY. Warm-up time is within two seconds, after that the unit will reply according to the selected mode.

Setting the selector to ALT will, when interrogated, broadcast the selected code plus the height of the aircraft based on the Standard Altimeter Setting.

Pressing the ident button will comply with a request to squawk 'Ident'; when the ident button is pressed while in the GND, ON or ALT modes, "IDT" will be illuminated on the display for approximately 18 seconds.

The aircraft will then be positively identified to the ATC unit. In normal use the reply indicator, to the right of the display window, will flash the reply nomenclature "R" in response to a valid Mode S or ATCRBS interrogation.

NAVIGATION EQUIPMENT

Introduction

The VOR/ILS/DME equipment installed in the IRIS G115E / Tutor T.1 consists of a KN 53 NAV receiver, a KX 155A NAV/COMM transceiver, a KMA 26 with Marker receiver and a KN 63 digital DME receiver.

The information from these units is displayed on a KCS 55A Horizontal Situation Indicator (HSI) and a KI 204 VOR/ILS/Glideslope indicator known as an Omni Bearing Selector (OBS).

Bendix/King KX155A Navigation Radio

The NAV facility of the KX 155A/KX 165A NAV/COMM transceiver is a sophisticated unit capable of digitally displaying active and standby frequencies, VOR radial information, course deviation information and ILS azimuth information.

DME information is displayed on the separate DME indicator and VOR/ILS information is displayed on the OBS.

Operation of the COMM facility is described in the previous section.

The unit operates over the frequency range 108.00 to 117.95 MHz in 50 KHz increments and is turned on using the On/Off/Vol control located on the left of the unit.

Frequency selection is similar to that of the KN53 above. Station identification is achieved using the NAV 2 on the ACS.

Depressing the MODE button will cycle the unit through its various display modes in the following order:

- Active/Standby Frequency.
- Active/ Course Deviation Indicator (CDI).
- Active/Bearing (To).
- Active/Radial (From).

Active/Standby Frequency Mode

Active and Standby frequency windows display selected frequencies. No course information is displayed.

Active/CDI Mode

In this mode, with the NAV frequency control pushed in, rotation of the frequency controls changes the frequency in the Active display. Depressing the NAV frequency transfer button will place the Active frequency in blind storage and transfer the Standby frequency to the Active window.

When the Active window is tuned to a VOR frequency the Standby frequency area is replaced by a 3 digit OBS display.

The OBS course value is tied to the NAV2 Indicator on the Left side of the instrument panel.

If no NAV signal is found for the desired frequency, the text 'FLAG' will appear on the radio.

Active/Bearing Mode

The frequency in the Active window is changed as above and the NAV frequency transfer button operates in the same fashion.

Pulling the inner frequency control has no effect. The Standby frequency area displays a bearing TO the selected VOR facility.

Should the received signal be too weak to ensure accuracy then the display will show "- - -".

Active/Radial Mode

The frequency in the Active window is changed as above and the NAV frequency transfer button operates in the same fashion.

Pulling the inner frequency control has no effect. The Standby frequency area displays a radial FROM the selected VOR facility.

Should the received signal be too weak to ensure accuracy then the display will show "- - -".

Bendix/King KN 53 Navigation Radio

The KN 53 NAV receiver provides VOR/DME/ILS information.

VOR/ILS information is displayed on the HSI and is provided over the frequency range 108 to 117.95 MHz in 50 KHz increments. DME channelling is provided for the KN 63 digital DME receiver.

Rotating the ON/Off/Vol control clockwise turns on the unit; NAV voice may be heard via the NAV 1 function on the ACS is pressed/illuminated.

Display brightness is automatically controlled.

Rotating the concentric frequency control, positioned on the right of the unit, selects a frequency in the STBY display. The outer control changes the MHz selection and the inner changes the KHz selection.

In both cases a clockwise rotation increments the frequency and rotation of the control beyond the frequency limits wraps the display around to the other end of the frequency band.

These selector knobs also control remote DME and internal glideslope channelling. The selected frequency is transferred to the Active display by pressing the frequency transfer button.

Bendix/King KN 63 DME Receiver

The KN 63 is a complete 100 watt, 200 channel remote DME system. Distances up to 389 NM, groundspeeds up to 999 kts. and time-to-station up to 99 minutes are computed digitally and displayed simultaneously.

Distance lock-on is virtually instantaneous with accurate groundspeed and time-to-station readouts following in less than one minute.

Moving the source selector switch away from the OFF position turns on the unit. DME channelling is dependent on selection of N1 or N2 (NAV 1 or NAV 2).

NOTE

For the purpose of this simulation, the DME HOLD function has been replaced with a GPS option for lateral navigation of a GPS flight plan.

Once the unit has locked on to the selected station, DME distance will be displayed in 0.1 NM increments up to 99.9 NM; then in increments of 1 NM to 389 NM.

Distance is calculated by electronically converting the elapsed time for signals to travel to and from the ground station. Groundspeed calculations are based on the rate of change of DME distance.

Time-to-station is calculated by dividing the DME distance by the computed groundspeed. Therefore, accurate groundspeed and time-to-station readouts are only available when the aircraft is tracking directly to or from a beacon.

When the function switch is set to N1 the DME channel is controlled by the frequency on NAV 1. Similarly, selection of N2 will enable NAV 2 to control the DME frequency.

If the unit is set to GPS, the flight plan loaded into the DGPS will display the DME data.

The DME facility may be identified by selecting DME on the audio control system.

Bendix/King KCS 55A Horizontal Situation Indicator

The KCS 55A HSI is a combined slaved compass system and VOR/ILS/Glide path display. The complete unit consists of a magnetic slaving transmitter mounted mid-wing on the starboard side, a slaving control and compensator unit, a directional gyroscope for stabilization of the system and the HSI display itself.

Track information from the DGPS may also be displayed when selected using the NAV1/GPS button to the right of the DME unit, however the button will always default to NAV1 if an ILS frequency is selected on the NAV1 receiver.

The display unit for the HSI contains flags and indicators to present a wide variety of information.

The various components of the unit are as follows:

- Compass Card
- Selected Course Pointer
- VOR/Localizer Deviation Bar
- Heading Select Bug
- To-From Indicator
- Glideslope Pointers
- Compass Warning Flag
- NAV Warning Flag

Compass Card

When responding to input from the slaved directional gyro, this card rotates within the display so that the aircraft heading is always under the lubber line.

Selected Course Pointer

This is a 2 part arrow, the head indicating the desired VOR or localizer course and the tail indicating the reciprocal. Rotating the course select knob sets the pointer.

VOR/Localizer Deviation Bar

When the aircraft is on the desired VOR radial, localizer or DGPS course, this bar forms the centre section of the Selected Course Pointer.

When off course it will be displaced to one side. Since the entire VOR/localizer display rotates with the compass card, the angular relationship between the deviation bar and the symbolic aircraft provides a pictorial, symbolic display of the aircraft's position relative to the selected course.

Each dot on the deviation scale represents 2° of deviation left or right of the selected VOR or DGPS course. When tuned to an ILS frequency the deviation is ½ ° per dot.

Heading Select Bug

This movable marker on the perimeter of the display is used to mark the desired heading. It is set by rotating the heading select knob.

To-From Indicator

This is a white triangle near the centre of the display that indicates, with reference to the course set on the select course pointer, whether the aircraft is flying to or from the selected VOR station.

Glideslope Pointers

Glideslope pointers move up/down against a linear vertical scale on each side of the HSI; the pointers come into view only when both a satisfactory signal (UHF) is received and the aircraft is close to the plane of the glide path.

During an ILS approach these indicators represent the vertical orientation of the glideslope with respect to the aircraft. A pointer high on the scale represents a glide path above the aircraft and a low pointer represents a glide path below the aircraft.

Full scale deflection represents approximately ½ degree deviation from the ideal glide path.

Compass Warning Flag

A red flag labelled HDG is visible in the upper right quadrant of the display whenever the power supplied is inadequate or the gyro is not up to speed.

If this flag is in view then the heading information is unreliable but the VOR/localizer and glide path deviation bars, the To/From indicator and the NAV flag will continue to give correct information.

NAV Warning Flag

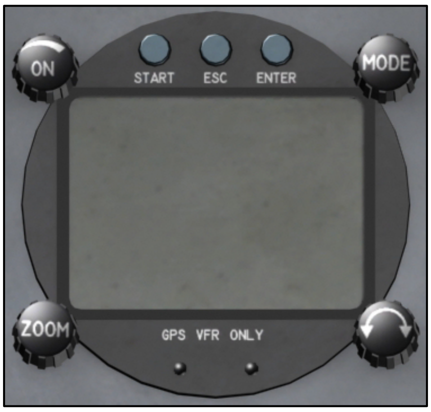
This red flag appears in the upper left quadrant whenever an unusable VOR/localizer signal is being received or the NAV receiver unit is not turned on.

NAV/GPS Selector

The NAV/GPS button directs either NAV 1 or GPS information to the HSI selected course deviation bar, however a safety system ensures that GPS information is not connected when an ILS frequency is selected on NAV 1.

The NAV/GPS button light will default to NAV when an ILS frequency is put on NAV 1 (if GPS was selected).

Filser LX 500 TR DGPS



The Filser LX 500 TR GPS provides continuous information in 3 dimensions and, using a large database, it stores and computes a wide range of information for reference in the air and for navigation.

The unit also incorporates a UHF transceiver which obtains data from a ground station which, in conjunction with the satellite information, greatly improves the accuracy of the aircraft computed position.

Operation with the ground station provides the differential mode (DGPS).

NOTE

This unit does **NOT** allow the direct input of flight plan data. It is a data display device and as such, the FSX/P3D Flight Planner tool or an external flight planning software may be required for flight plan creation.

CAUTION

Due to the nature of the unit and programming limitations at the time of development, some features relating to the accurate operation of the unit may not be simulated.

The LX 500 TR is equipped with 4 rotary knobs and 3 push buttons which have the following functions;

CONTROL	**FUNCTION**
On/Off Knob	Clockwise – ON, Anticlockwise – OFF.
Mode Knob	Program mode selection

Using the Mode Knob, a number of programs can be displayed on the unit.

- Position Mode
- Near Airport Mode
- Navigation Mode
- Timer Mode
- Destination Airport Mode

Position Mode

This page is the default power up mode and displays GPS status, present position in latitude and longitude, altitude and Zulu time.

Near Airport Mode

The NEAR AIRPORT programme continuously calculates and updates the six nearest NAV database airport positions and shows the following information for each on the display:

- Name
- Bearing to (TO) NAV point
- Distance (DIS) from present position to NAV point (NM)

Navigation Display Mode

This contains all the information necessary to navigate to a pre-determined waypoint.

At the uppermost element of the screen is the waypoint identifier and unit mode (i.e., NAV)

On the main screen from left to right, top to bottom are the following elements;

- **BRG** – Bearing to next DGPS waypoint.
- Distance to next DGPS waypoint.
- **TRK** – Track to next DGPS waypoint.
- **GS** – Computed groundspeed in knots.

TO – Desired Track to next DGPS waypoint.

On the bottom right of the main display is a course deviation distance from desired track in nautical miles.

Timer Mode

The Time mode function displays required timers in relation to the loaded DGPS flight plan.

At the uppermost element of the screen is the destination airport name, identifier and navigation mode (i.e., NAV).

On the main screen from left to right, top to bottom are the following elements;

- **ACT T.** – Actual Local Time.
- **ETA** – Estimated Time of Arrival at the destination airport in local time.
- **ETE** – Estimated Time En-route to the destination airport.

Destination Airport Mode

The Destination Airport mode displays required information in relation to the destination airport on the loaded DGPS flight plan.

At the uppermost element of the screen is the destination airport name, identifier and navigation mode (i.e., NAV).

On the main screen from top to bottom are the following elements;

- **ICAO** – ICAO Code of the destination airport.
- **NAME** – Name of the destination airport.
- **ELEV** – Elevation of the destination airport in feet.
- **TC** – Circuit height of the destination airport in feet.

WARNING

The TC Value DOES NOT take into account terrain information or local obstacles when flying. Pilots should take all care in operating in low visibility conditions when flying circuit height around the destination airport.

INSTRUMENTATION

Introduction

A pitot-static system supplies an airspeed indicator (ASI), both altimeters, and a vertical speed indicator (VSI). An alternate static system is also provided in the event of primary system failure.

The attitude indicators (AI) and turn-and-slip indicator are electrically driven and are powered from separate busbars.

Also fitted are various engine instruments and an accelerometer, standby magnetic compass and chronometer.

Manifold Pressure / Fuel Flow Indicator

A combined gauge shows manifold pressure on the upper scale graduated in inches of mercury (IN HG) from 10 to 35 and traversed by a pointer marked M. Fuel flow is indicated by a pointer marked F on the lower scale and is calibrated in litres per hour.

RPM Indicator

RPM are indicated on a scale graduated zero to 3000. A red radial line is at 2700 and a green arc covers the range 1800 to 2500 RPM.

The RPM needle parks below the 0 graduation; on power-up the indicator requires at least 5 seconds and sometimes longer before the needle moves to the 0 graduation when it is ready to accept RPM signals.

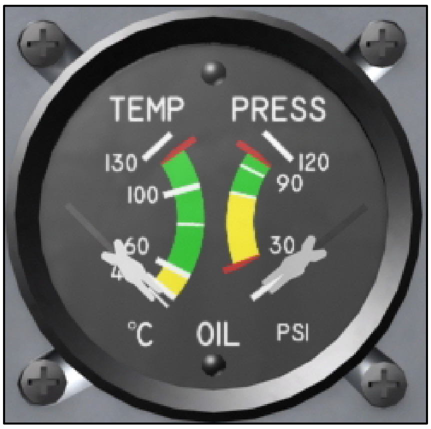
Engine start before the indicator shows zero will result in either no or incorrect RPM indication.

Cylinder Head Temperature/Fuel Pressure Indicator

A combined gauge shows Cylinder Head Temperature (CHT) on the right hand side marked 0°C to 300°C. A red radial line is at 260°C, an amber arc covers the range 0°C to 65°C and a green arc covers 65°C to 260°C.

The Left Hand Side of the gauge shows fuel pressure in pounds per square inch (psi) on a scale marked 0 to 60 with red radial lines at 14 and 45 psi and a green arc covering the range in between.

Oil Temperature and Pressure



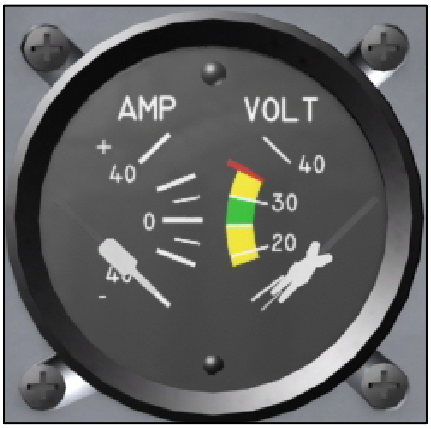
A dual gauge displays temperature on the left hand side and pressure on the right. The temperature scale is graduated 40°C to 130°C with a red radial line at 120°C, an amber arc covering 40°C to 60°C and a green arc covering 60°C to 120°C.

Oil pressure is indicated on a scale graduated 0 to 120 psi with red radial lines at 25 and 100 psi, amber arcs covering 25 to 60 and 90 to 100 psi and a green arc covering 60 to 90 psi.

Exhaust Gas Temperature/Outside Air Temperature

A combined gauge displays EGT on the left hand side on a scale marked 1200°F to 1700°F. OAT, calibrated in degrees Celsius, is displayed on the right.

Volts and Amps Indicator



The voltmeter/volt indicator indicates the voltage on the Essential busbar. The LO VOLT caption on the CWP illuminates when the Essential busbar voltage is less than 25 ± 0.5 volts.

An ammeter/amp indicator shows the flow from the battery or external supply to the busbars; a negative charge shows battery discharge and a positive charge shows the generator charging the battery.

Fuel Quantity Indicator

The fuel gauge float sensor in each wing is at maximum travel with 63 litres in the tank hence the extra 12 litres in each main tank is ungauged.

More than 60 litres of fuel in the tank is shown on the gauge as full needle deflection marked 60+.

Airspeed Indicator

The ASI is a single pointer instrument with a scale graduated from 35 to 200 kts. in 5 knot increments. The instrument face is marked with white, green and amber arcs that graphically represent operating ranges in differing configurations.

There is a red radial line indicating VNE and a blue radial line at the recommended sea level climbing speed.

Altimeter

The altimeters on each side of the instrument panel are identical. Altitude is shown on the dial by 3 pointers; the longest pointer indicates hundreds of feet, the second slightly shorter, diamond-shaped pointer indicates thousands of feet and the shortest pointer indicates tens of thousands of feet.

A millibar scale is in a window on the right of the instrument and can be set to the required barometric pressure by the knob at the lower left of the instrument.

Vertical Speed Indicator

The VSI is marked to indicate rates of climb and descent between 0 and 2000 fpm on a scale graduated at intervals of 100 fpm.

Mechanical stops are incorporated to prevent the indicator needle passing the 2000 fpm indication.

Attitude Indicator

The AIs on each side of the instrument panel are AIM 1100 or Mikrotechna LUN 1241 series electrically driven instruments powered from separate busbars.

The primary instrument, the starboard AI, is powered from the Essential busbar and the other, the alternate instrument, is powered from the Avionics II busbar. Each gyroscope is connected to a blind marked with a horizon line and lines representing pitch values of 5°, 10°, 15° and 20° of climb and dive.

A warning flag is incorporated which is displayed when power to the instrument has failed, the rotor speed is too low, or the pull for quick erect knob is used.

With the gyroscope erected, deviation of the aircraft from straight and level is shown by displacement of the pitch lines relative to the horizon line. Bank angle is shown by the scale at the top of the instrument that is marked for 10°, 20°, 30°, 60° and 90° of bank.

Parallax errors are removed by rotating the left knob to adjust the position of the centre "wings". A toppled gyro can be recovered by pulling the knob marked "PULL TO CAGE/PULL FOR QUICK ERECT".

This aligns the gyro to the zero pitch and bank attitude relative to the instrument case by means of mechanical cams thus the aircraft must be in straight and level flight at 100 kts. before erecting the instrument.

The instrument remains accurate up to ± 85° of pitch and through 360° of roll.

Turn and Slip Indicator

This is a ball-and-pointer instrument in which a ball moves about the centre of a glass tube to indicate sideslip. The pointer, connected to a gyroscope, traverses a scale that indicates rate of turn, the markings denoting a rate one turn of 3° per second.

The instrument is electrically operated and incorporates a warning flag that appears when there is no electrical power supplied to the instrument.

Accelerometer

This is a 3-pointer instrument graduated in acceleration g units from -4 to +10 in half unit steps. The main pointer indicates the instantaneous acceleration normal to the aircraft about 1g, the reading in un-accelerated flight.

Two auxiliary pointers show the greatest positive and negative accelerations achieved since the instrument was reset. A PUSH TO SET knob on the instrument allows the auxiliary pointers to be reset to 1g.

Standby Magnetic Compass

The compass is a permanent bar, liquid-damped instrument mounted centrally on the coaming. The markings are at 5° intervals and a range of 60° is visible in the window.

Illumination is by an integral lamp. Residual compass errors of up to 10° can occur. A deviation card is mounted on the starboard canopy arch.

Chronometer

The chronometer is powered electrically. The clock displays the time with a conventional 2 hand 12 hour display. Some clocks have a 60 seconds display on an internal scale and the date displayed in a small aperture near to the 5 o'clock position.

SECTION 2

NORMAL PROCEDURES

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SECTION 2

CHAPTER 1

PREPARATION FOR FLIGHT

Before Starting

Check the aircraft tech log for completeness and validity and confirm aircraft weight and mass moment limits.

If operating away from base determine the weather for the prevailing conditions. The aeroplane should be given a thorough pre-flight and walk around check.

WARNING

Always treat the propeller as live. With the switches OFF, any rotation of the propeller, combined with an electrical earth fault, could cause the engine to start, resulting in serious injury to anyone near to or within the propeller disc.

After completing the external checks, enter the cockpit and set the pedals to a comfortable position.

Fasten harnesses and ensure that, if solo, the harness for the LH seat is also fastened. Set the parking brake by first sliding the parking brake lever to the SET position and pressing both brake pedals until full resistance is felt.

One moderate application of pressure is normally sufficient but further pressure can be applied to the wheel brakes at any time by pressing down harder at the toe brakes.

Complete the cockpit checks in accordance with the appropriate checklist.

Starting the Engine

Ensure that the propeller area is clear and follow the checklist to start the engine.

Open the throttle, such that the throttle lever top moves no more than one centimetre, and press the starter button firmly.

Once the engine is running, release the starter button and move the MIXTURE lever forward to the RICH setting.

With the engine running, set the engine speed to between 1000 and 1200 RPM using the throttle.

As the engine warms up, the RPM will creep up, this is normal and acceptable; use the throttle to maintain a maximum of 1200 RPM. Confirm that the oil pressure has reached a minimum of 25 PSI within 30 seconds.

If the oil pressure does not reach the minimum required, shut down the engine and do not attempt to restart.

If the engine does not start after 10 seconds of cranking, release the starter button. Check all the engine settings and, after allowing the starter motor to cool for 30 seconds, attempt a further start.

If the STARTER caption does not go out, or it is suspected that the starter motor is still engaged, turn off the GEN and BAT switches, and then shut down the engine to prevent a fire.

Do not exceed 1500 RPM until ready for the engine test checks. RPM values greater than this will cause excessive wear to a cold engine.

After Starting

Carry out the After Starting Checks. The ignition check is achieved by moving the ignition switch from BOTH to R, back to BOTH, from BOTH to L and finally back to BOTH.

The RPM should drop slightly on R or L alone but the engine should not stop. If the engine cuts out then a dead magneto exists. If the RPM does not reduce when selecting R and L, then a live magneto exists. In either case, shut down the engine and have the fault rectified.

To check the correct operation of the flaps, select the flaps from UP to FULL and then to UP whilst visually checking the flap movement on both wings and the flap indication.

Taxiing

Do not wait for the engine to warm up but taxi as soon as possible. Set 1200 RPM, which is sufficient to start moving at max all up weight (AUW), then reduce power to control the speed, using wheel brake if power alone is insufficient to maintain a safe taxi speed.

Avoid using brake against power but caution should be exercised when taxiing with a cold engine or tailwind, as RPM may drop below 800 with the throttle closed.

Check the nose wheel steering and brakes for correct operation as soon as practicable. Confirm the correct functioning of the flight instruments as the opportunity arises on taxiing.

Full deflection of the rudder pedals will deflect the nose wheel sufficiently for most turns; for a tighter turn also apply brake on the inside wheel but avoid locking the wheel as this may cause tyre damage.

The aircraft is not to be operated when the wind is gusting at, or in excess of, 40 kts. on the ground.

When taxiing crosswind in high winds there may be a tendency for the into-wind wing to lift; full aileron deflection may be required to counter this tendency.

Testing the Engine

Test the engine in accordance with the checklists, with the nose wheel straight and keeping the control column in the central position. Keep the ground operation of the engine at high power to a minimum to avoid overheating.

When exercising the propeller RPM control, ensure that the lever is operated throughout its range and that the RPM changes by 500, but no more. This allows maximum circulation of the oil between the engine and propeller and prevents a build-up of sludge within the propeller pitch change mechanism.

Whilst testing the magnetos at 2000 RPM, if the ignition switch is inadvertently selected to OFF or if the engine cuts dead, do not reselect the switch to BOTH. Allow the engine to run down and then restart.

To set BPM before take-off, apply full power with the aircraft stationary and adjust the mixture to the placard fuel flow appropriate to the altitude less 4 lph.

For example, at sea level set 55 lph. After setting BPM and before reducing power, confirm that 2350 RPM minimum is indicated.

SECTION 2

CHAPTER 2

HANDLING IN FLIGHT

Take-off

After carrying out the Pre-Take-Off Checks, align the aircraft with the take-off path, release the brakes and smoothly open the throttle fully.

As soon as practicable after selecting full power, carry out the Checks during Take-Off. The RPM should increase smoothly to 2700 as the aircraft accelerates.

With no crosswind the aircraft yaws gently to the left and the nose wheel steering and the rudder are effective for directional control. At 60 kts raise the nose wheel to fly cleanly off and apply more rudder to compensate for the loss of nose wheel steering.

If a caption illuminates on the CWP then consideration should be given to abandoning the take-off and having the fault investigated. For take-off on a grass runway reduce the load on the nose wheel as early as possible.

In crosswind conditions, initially up to full aileron may be required to prevent the into-wind wing from rising.

After take-off, hold the aircraft in a shallow climb and allow the speed to increase to climbing speed. At 80 kts and a minimum of 150 ft, select the flaps UP and carry out the After Take-Off Checks.

Climbing

Climb at full throttle with maximum RPM at 80 kts IAS up to 5000ft/FL50 and thereafter at 75 kts. When appropriate, carry out the Airfield Departure Checks unless remaining in the circuit.

It is not necessary to switch off the Auxiliary fuel pump early; incorporate it into the checks in the normal way. Check the mixture setting during the initial part of the climb. Best rate of climb speed at sea level (Flaps UP) is 80 kts IAS.

The recommended best angle of climb at sea level (Flaps at Take-Off) is 67 kts.

General Flying

Changes of attitude resulting from configuration changes are very small but are magnified by the change of speed that follows. The changes of attitude are:

- Flap down..........................Nose down
- Flap up..............................Nose up
- Power on...........................Nose up and left
- Power off...........................Nose down and right

The aircraft is stable although accurate trimming is not always easy. Lateral balancing may be carried out by alternate selection of the wing fuel tanks; however, the fuel asymmetry should not be allowed to exceed 20 litres.

When flying solo a slight roll to starboard may be apparent and expected.

If the aircraft is flown markedly out of balance (e.g. gross sideslipping), oil in the sump may move far enough to uncover the pick-up pipe, indicated by the oil pressure reducing below normal limits.

Prolonged flight in this regime will progressively damage the engine and may eventually result in mechanical failure. Therefore, if the oil pressure does reduce below normal limits, balanced flight must be resumed within 10 seconds.

Flight in Icing Conditions

The IRIS G115E / Tutor T.1 has no airframe or propeller de-icing or anti-icing protection and only limited engine de-icing.

For this reason the Tutor is not cleared for flight into icing conditions. If such conditions are encountered, the aircraft should immediately be flown clear.

Flight in Turbulent Conditions

The recommended speed for flight in turbulent conditions is 100 kts. The flaps should be selected UP to reduce the risk of exceeding the flap acceleration limits.

Engine Handling

Proper use of the engine controls to set MP, RPM and fuel/air mixture will not only increase power and improve fuel economy but will also reduce the risk of engine failure and prolong its life.

Good engine husbandry should always include the following:

- Set the throttle carefully before starting the engine. This will ensure that the engine is not started at a high power setting before the lubrication system is able to operate fully.

- Use smooth throttle movements, taking approx. 3 seconds to change from idle to full or the reverse.

- Do not slam the throttle closed or hold the throttle back against the idle stop.

- Avoid RPM / MP combinations that cause over boosting and detonation damage. A placard lists the maximum MP settings. Alternatively, avoid a MP higher than (RPM ÷ 100) plus 3½.

- Monitor the engine instruments and take prompt action to avoid limitations being exceeded.

Mixture Control

Control of the engine fuel/air mixture is achieved by adjusting the fuel flow with the Mixture lever. Moving the mixture lever forward enriches the mixture and increases fuel flow and vice versa.

Moving the lever aft, to the fully lean position, will shut off fuel completely, causing the engine to stop. The three mixture settings relevant to Tutor operations are Best Power Mixture (BPM), Best Economy Mixture (BEM) and Endurance.

BPM. This setting is used for almost all training exercises flown on the Tutor. Before take-off, with the aircraft stationary and full power applied, adjust the mixture to the placard altitude fuel flow, less 4 lph;

i.e. at sea level set 55 lph. In flight, with full power and HIGH RPM selected, confirm that the fuel flow corresponds to the placard altitude value, interpolating the value and adjusting the mixture if necessary.

BPM is now set for all throttle settings. Pilots should be aware, however, that setting BPM at higher altitudes might lead to rough running on descent.

BEM. This setting is rarely used in normal Tutor operations and then only at 75% power or less. If flying for maximum range and into a strong headwind, some advantage may be obtained by setting BEM.

Endurance. Best endurance is obtained by flying the aircraft at the power settings given in the Checklists, with the flaps UP and at the lowest practical safe altitude.

Descending

Cruise Descent. The normal descent technique used in the IRIS G115E / Tutor T.1 is the Cruise Descent. It is flown at 100 kts, using 10" MP, which is sufficient power to keep the engine warm during the descent and free from plug fouling.

Gliding. The recommended gliding speed is 75 kts. In still air with the throttle closed, the clean aircraft travels approximately 1.25 nm per 1000 ft height loss with the RPM control set to HIGH and 1.5 nm per 1000 ft with LOW RPM set.

CHT reduces quickly during a closed throttle descent and the spark plugs rapidly become contaminated with oil. Power response may then be poor and engine damage may occur.

Following a simulated engine failure, to sustain the CHT and prevent the spark plugs from oiling up, the engine must be warmed at regular intervals during descent by applying full power for about 3 seconds.

These engine warms should be performed at least every 1000 ft to prevent oiling up. The CHT must not be allowed to fall below 65°C, and ideally not below 100°C.

Stalling

The aircraft exhibits mainly benign stall characteristics. Natural stall warning is given by mild airframe buffet and light vibration on the elevators. The quality of the warning varies with aircraft configuration, decreasing in amplitude and margin with progressive extension of the flaps.

Artificial warning is given by a warning horn that activates 5 to 10 kts above stall speed. The approximate stalling speeds at an operating weight of 990 kg for both Normal and Alternate static sources are:

Aircraft Configuration	Speed (Knots)	
	Normal	Alternate
Power Off, Flaps UP	52	52
Power Off, Flaps TAKE-OFF	50	49
Power Off, Flaps LAND	49	48
Power Off, Flaps FULL	49	45
Power On, Flaps LAND, Typical Approach Configuration	52	47
Power On, Flaps FULL	52	47

The stall in the turn is indicated by moderate buffet and a tendency for the aircraft to roll to the right irrespective of the direction of turn.

Recovery from the stall in all cases is straightforward. Releasing the backpressure on the control column produces an immediate recovery.

WARNING

Use of the rudder whilst stalled will cause the aircraft to depart.

Spinning

The aircraft is cleared for spinning at all weights up to 990 kg. Intentional spinning with flap extended is prohibited and spinning should be conducted with no load in the baggage compartment.

In the worst case, height loss for a spin can be up to 400ft per turn. An allowance of 2000ft must be made for recovery.

Normal Spin Entry.

With the aircraft trimmed for 100kts (the trim will be at approximately the take-off position), decelerate with the throttle at idle, do not trim but maintain straight and level.

At 60kts move the control column fully back keeping the ailerons neutral; simultaneously apply full rudder in the direction of the required spin. The aircraft will initially pitch up and roll and then, after about 360° of roll, the nose of the aircraft will drop into a full spin.

The normal spin is maintained by holding the control column fully back with the ailerons central and full rudder deflection in the direction of spin. The spin will stabilise between 60kts and 86kts with each turn taking up to 3 seconds.

Recovery

There is only one recommended recovery technique from developed spins and deviation from this technique could prevent recovery. If the aircraft enters a fully developed spin the following recovery action **must** be taken:

a. Check height sufficient for recovery

b. Check throttle closed.

c. Check the direction of the turn needle.

d. Apply and hold full rudder to oppose the turn needle.

e. Pause (approximately one second).

f. Control column forward to the central position (smoothly keeping the ailerons neutral).

g. When the spin stops, centralise the rudder.

h. Recover from the ensuing dive.

The aircraft usually recovers from a normal spin within 1 - 2 seconds, completing about one additional turn as it does so.

Incipient Spins. Only the first 360° of roll may be considered as an incipient spin. To recover at the incipient stage, recovery action must be taken within this parameter and initiated as soon as possible after recognition of departure. Centralising all flying controls promptly produces a successful recovery.

Alternative (Emergency) Spin Recovery.

To recover from a spin the Tutor Full Spin Recovery should be used. However, if having completed the Full Spin Recovery, a pilot finds himself disorientated or the aircraft does not recover as he would expect, he may consider the Alternative Spin Recovery drill:

a. Rudder Full Opposite to Spin Direction (Turn Needle)
b. Aileron Release
c. Elevator Release

Aerobatics

Abrupt or full control applications are not permitted at speeds in excess of VA. The following is a list of approved aerobatic manoeuvres together with recommended entry speeds for inexperienced pilots:

Aileron Roll	130 kts	Derry Wingover	130 kts
Barrel Roll	120 kts	Pushover, from vertical up	60 kts
Wing Over (Chandelle)	130 kts	Split S (from level)	85 kts
Cuban Eight	130 kts	Split S (from climb)	130 kts
Half Roll and Pull Through	85 kts	Aileron Turn (opposite of vertical roll)	80-100 kts
Horizontal Eight	130 kts	Hesitation Stall Turn	140 kts
Roll off the Top (Immelman)	135 kts	Hesitation Roll	130 kts
Knife Edge Flight	135 kts	Noddy Stall Turn	140 kts
Lazy Eight	130 kts	Vertical Roll	150 kts
Loop	130 kts	Outside Loop (erect)	70 kts
Outside Turn	130 kts	Outside Loop (inverted)	150 kts
Slow Roll	130 kts	Reverse Stall Turn	140 kts
Stall Turn	120 kts	Rolling Turn	130 kts
Quarter Clover	120 kts	Dynamic Spinning (flick entry) (max IAS)	100 kts
Derry Turn	120 kts		

Dynamic Spin

The dynamic spin, or flick entry, is an auto-rotative manoeuvre induced using pro-spin control.

It is only permitted in the IRIS G115E / Tutor T.1 with speed at or less than 100kts. The roll rate is very rapid, much faster than a conventional rolling manoeuvre, with increased roll rate at higher entry speed.

The snap may be employed in any manoeuvre subject to the airframe IAS and acceleration limits. It requires rapid and timely use of the controls but not necessarily the use of full control deflection and is flown as follows:

To enter, bring the control column (CC) back sharply to pitch the nose just beyond the critical angle of attack (AOA), recognised from demonstration and from experience.

How far back the CC moves is determined by the IAS and by how rapidly the CC is applied; the higher the IAS the less aft CC required but the faster the movement of the CC needs to be.

Exceeding critical AOA by a large margin leads to high drag, large energy loss and lower rotation rate.

After moving the CC back but, before the critical AOA is reached, aggressively apply full rudder in the required direction of roll. Autorotation commences.

If a snap roll through more than 180 degrees is required full rudder in the direction of roll should be maintained but the CC should be moved forward to a more neutral position as sustained rearward deflection can lead to a high drag situation and may impose undue loading on the fuselage.

During autorotation the following control inputs accelerate the roll rate:

- Aileron in the direction of roll.
- Forward movement of the CC.

To stop the roll, apply full opposite rudder until the rotation stops then instantly neutralise the CC and rudder. For a precision exit anticipate the rollout attitude by 90 degrees when applying rudder.

The high tempo of the manoeuvre, more acute at higher entry IAS, makes it a challenging event to master.

Building up from a lower IAS entry is the way to learn.

CAUTION

A flick entry at limiting IAS on a downward flight path risks airframe overstress.

Simulated Emergencies

Some drills for simulated emergencies may be practised with full switch selection but others may not.

Careful briefing is necessary to avoid mistakes. It is usually sufficient to do touch drills, i.e. touch the switch/selector without disturbing it from the normal flight position. In particular, during practice engine failure drills do not move the mixture lever.

Simulated Forced Landing

When simulating a forced landing, it is essential to ensure that the aircraft is configured for landing in the event of actual engine failure in the latter stages of the approach or go-around.

For this reason, the PRE-LANDING CHECKS (with the exception of take-off flap) should be completed prior to reaching the Hi-Key position. In addition, on the crosswind leg of the forced landing pattern, an engine warm should be carried out.

If the CHT has fallen below 100°C, carry out a full engine warm for 3 secs or until the engine responds normally, whichever is the longer period. If the CHT is above 100°C it is acceptable to carry out an engine warm for about 1 sec as long as the engine responds correctly.

If the CHT is below 65°C, discontinue the PFL until the engine is once again within normal operating limits.

SECTION 2

CHAPTER 3

CIRCUIT AND LANDING PROCEDURES

Approach Procedures

Instrument approach settings are given below;

	Flap Position	RPM	Throttle	IAS
Initial Descent and Pattern	UP	2400	10" MP	100
Glidepath	TAKE-OFF	HIGH	Approx 17" MP	100

Circuit Procedures

Normal speed downwind in the circuit is 80 kts. Carry out the Pre-Landing Checks and fly the finals turn at 75 kts. rolling out on the centreline at 400 ft. and just less than 1 mile from the runway threshold.

At 400 ft. select LAND flap (or FULL flap if considered necessary) and fly the final approach at 70 kts. On short finals start reducing the IAS with a small power reduction in time to achieve threshold speed as the runway threshold is crossed.

Landing

The flare is commenced at a suitable height with backward movement of the control column and closure of the throttle. The nose is pitched up at a rate to control the now reducing rate of descent and the airspeed decays below the threshold speed (the stall audio may sound).

At touchdown, beyond the runway threshold, the aircraft is in a nose high attitude that ensures that the main wheels touch first and the rate of descent is reduced to almost nothing.

Gently lower the nose wheel several seconds after the main wheels settle on the runway. Accurate trimming does much to ensure a good touchdown.

Roller Landings

Roller landings are usually executed with a final flap setting of LAND. When all three wheels are firmly on the ground, leave the flaps and elevator trim in their set position, open the throttle fully and fly the aircraft off at the same speed as for a normal take-off.

There is no difference in technique if rolling with FULL flap.

At 70 kts. and with a positive rate of climb raise the flap to TAKE-OFF. Select flaps UP on reaching 80 kts. and 150 ft.

Going Around

When the decision is made to go around, smoothly apply full power and raise the nose to select the take-off attitude. If the aircraft was trimmed for a low airspeed on the approach the control column pitch force may be significant.

The aircraft accelerates and climbs safely with FULL flap; raise the flaps within the speed and height limitations and complete the After Take-off Checks.

Braking Techniques

As soon as the main wheels are on the ground lower the nose wheel to the runway. Apply the wheel brakes gently at first to avoid locking a wheel; it is difficult to detect if a wheel is locked from the cockpit.

Increase braking pressure as the groundspeed decreases. For optimum braking performance, as the nose pitches down with the first braking application, pull back progressively on the control column whilst keeping the nose low with increased braking.

Nose Wheel Shimmy

Shimmy is vibration caused by the wheels of a moving vehicle. In an aircraft, nose wheels and tail wheels are prone to shimmy. It can occur in any axis and a disturbance in one axis can exacerbate vibration in another.

The IRIS G115E / Tutor T.1 nose wheel has an oil-filled shimmy damper but problems can still occur if the runway surface is poor, the landing is poorly executed or there is a technical defect in the nose wheel assembly.

After Landing

Complete the After Landing Checks. When parked at the apron, close the throttle, apply the parking brake and complete the Shutdown procedure.

The ignition check, carried out at 900 RPM, is achieved by moving the ignition switch from BOTH to R, observing a small RPM drop, and returning to BOTH with RPM recovery.

The procedure is then repeated, selecting L. Finally, briefly select OFF and return to BOTH observing that the engine would dead-cut (i.e. stop) with OFF selected.

When shutdown is complete, release the parking brake if appropriate and vacate the aircraft.

WARNING

The ignition shutdown check must be completed thoroughly and not rushed, particularly the OFF/dead-cut check.

Failure to identify a faulty live magneto will result in an engine that may start when the propeller is rotated, inadvertently or otherwise, despite the ignition and BAT switch being off.

SECTION 3

OPERATING LIMITATIONS

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AIRFRAME

Maximum Speeds

Never exceed speed (VNE)	185 kts
Maximum normal operating speed (VNO)	150 kts
Maximum design manoeuvring speed (VA)	130 kts
Maximum speed with flaps at TAKE-OFF (VFE)	125 kts
Maximum speed with flaps beyond TAKE-OFF (VFE)	110 kts
Maximum speed for dynamic spin entry	100 kts
Maximum speed with canopy fully open	80 kts
Maximum speed with canopy in vent position (emergency only)	100 kts

Operating Limitations

Maximum altitude	FL 100
Minimum OAT (at MSL)	10 °C

Aerobatics and spinning are prohibited when baggage is carried.

Weight

Take-off and Landing	990 kg
In baggage compartment	55 kg

Airfield Limitations

Maximum wind speed	40 kts
Maximum crosswind	25 kts

Arrester Gear Trampling

Supported cables should be trampled at a slow walking pase.

Negative G

Any continuous period of flight under negative G should not exceed 3 minutes.

Normal Acceleration

Flaps retracted	+6g to -3g
Flaps extended	+3.8g to 0g

Limitations for Raising Flap

LAND / FULL to TAKE-OFF	70 kts min
TAKE-OFF to UP	Above 150 ft AGL / 80 kts min

NOTE

The quoted speeds may be reduced by 5 kts above FL 50 / 5000 ft.

ENGINE LIMITATIONS

RPM

Maximum permissible RPM	2700
Ground idling RPM	800 +/- 50

Maximum Permitted MP (in HG)

RPM	1800	1900	2000	2100	2200	2300	2400 & above
MP	21.0	21.9	23.1	24.4	25.9	27.6	Full Throttle

Magneto Drop at 2000 RPM

Minimum drop on each magneto	50 RPM
Maximum drop on each magneto	175 RPM
Maximum difference between RPM on individual magnetos	50 RPM

Cylinder Gear Temperature

Minimum during flight	65 °C
Maximum at full throttle	260 °C
Maximum at BPM (Cruise)	225 °C
Maximum at BEM (Cruise)	205 °C

Oil Pressure

Maximum during start and warm-up	100 PSI
Minimum at ground idle	25 PSI
Normal operating range	60 to 90 PSI

Oil Temperature

Maximum permitted	120 °C
Minimum operating	60 °C
Minimum for take-off	40 °C

Fuel

Maximum fuel pressure	45 PSI
Minimum fuel pressure	14 PSI
Maximum fuel asymmetry	20 litres

APPENDIX 1

PERFORMANCE CHARTS

En-Route Climb – ISA, Flaps UP, Max Power, Max AUW

SL to Altitude (ft)	Time (Mins)	Distance (NM)	Fuel Used (litres)
2000	2.5	3.3	2.2
4000	5.4	7.1	4.8
6000	8.7	11.5	7.6
8000	12.7	16.5	11.0
10000	17.7	22.8	15.0

Range and Diversion – ISA, Still air, 20 litres reserve, BPM and 2400 RPM.

Altitude (ft)	IAS (Kts)	Indicated Fuel (litres)	Range (NM)	Time (Mins)
SL	100	120	294	176.5
4000 ft			284	157.9
8000 ft			279	148.5
SL	100	80	181	109.0
4000 ft			172	97.3
8000 ft			169	90.0
SL	100	40	62	37.5
4000 ft			59	33.3
8000 ft			57	31.5

Endurance – ISA, Flaps UP. (Endurance is hours remaining until tanks dry)

Altitude (ft)	IAS (Kts)	RPM	Fuel Flow (Litres/hr)	Indicated Fuel (Litres)	Endurance (Hours)
SL to 10000 ft	80	1800	20	120	6
				80	4
				40	2

Descent – ISA, Flaps UP, 10in MP, 100 kts IAS, RPM HIGH

Altitude to SL (ft)	Time (Mins)	Distance (NM)	Fuel Used (litres)
10000	10	17.8	5.9
8000	8	14.0	4.7
6000	6	10.4	3.5
4000	4	6.9	2.3
2000	2	3.4	1.2