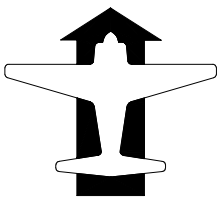
OPERATIONS MANUAL

MARK 4 SENA (Single Engine Non Approved)
SYNTHETIC TRAINER

V4.0



AERO-GUIDANCE®
SYNTHETIC TRAINER SYSTEMS

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MARK 4 SINGLE ENGINE

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INTRODUCTION.

The AERO-GUIDANCE MARK 4 SYNTHETIC INSTRUMENT TRAINER is a software based system that couples the reliability and graphical presentation capability of modern desk-top computer equipment with a simple man-machine control panel that provides control devices very similar to those found on conventional light single-engine aircraft.

The MARK 4 trainer simulates a light single-engine aircraft having a fixed-pitch propeller and retractable undercarriage with a cruise speed in the range 120 - 130 knots indicated. It is equipped with a conventional attitude flight panel including a moving card Heading Indicator; airframe, engine and fuel management panels, a 3-axis auto-pilot, a clock and a stop-watch. A navigation aid panel is provided which is equipped with a fixed-card ADF, a VHF Nav receiver having VOR, ILS and Markers, and a DME receiver. A GPS is provided with “Go To” capability and access to a full data-base of waypoints in addition to the navaid and aerodrome data. User waypoints can also be created.

The data file contains information on all Australian navaids, aerodromes and waypoints (as listed in ERSA). It is possible therefore to "fly" any published procedure except GPS Approaches.

Wind and turbulence conditions can be set or changed at any time and the trainer will respond accordingly.

Flight progress can be examined at any time. This is accomplished by a simple (reversible) keyboard command that replaces the normal instrument panel display with a combined track-made-good and altitude profile display. The track display is oriented True North and plots the trainer's track in relation to any navaids (up to the last 50) that have been tuned. These plots can be viewed at any time during which the trainer will "freeze". Plot information is progressively updated and plot data is retained.

MARK 4 S.E. Synthetic Trainer. Copyright © AERO-GUIDANCE.

MARK 4 EQUIPMENT CHECK-LIST.

SUPPLIED IN THIS PACKAGE:-

AERO-GUIDANCE MARK 4 (Single Engine) Synthetic Trainer software.
Aeroguidance *KTI Software Adaptor*
Yoke assembly.
Rudder Bar assembly.
Manual

SUPPLIED BY THE CUSTOMER :-

A computer having the following minimum specifications:-

TYPE	IBM PC ™ or similar
PROCESSOR	Intel/AMD – 1GHz or greater
RAM	512Meg minimum
AUDIO	Sound card and speakers
VIDEO CARD	AGP or PCI Express 64MB minimum. OpenGL Compliant
DISPLAY	Minimum 800x600
MONITOR	VGA colour, 15 inch minimum.
PORTS	3 x USB ports or USB hub or (1 x serial and 2 x USB)
DISK DRIVES	1 x CD ROM and Hard drive with 1GB free space
SOFTWARE	Windows XP

Approach plates, charts, etc. to suit intended exercise.

EQUIPMENT SET-UP

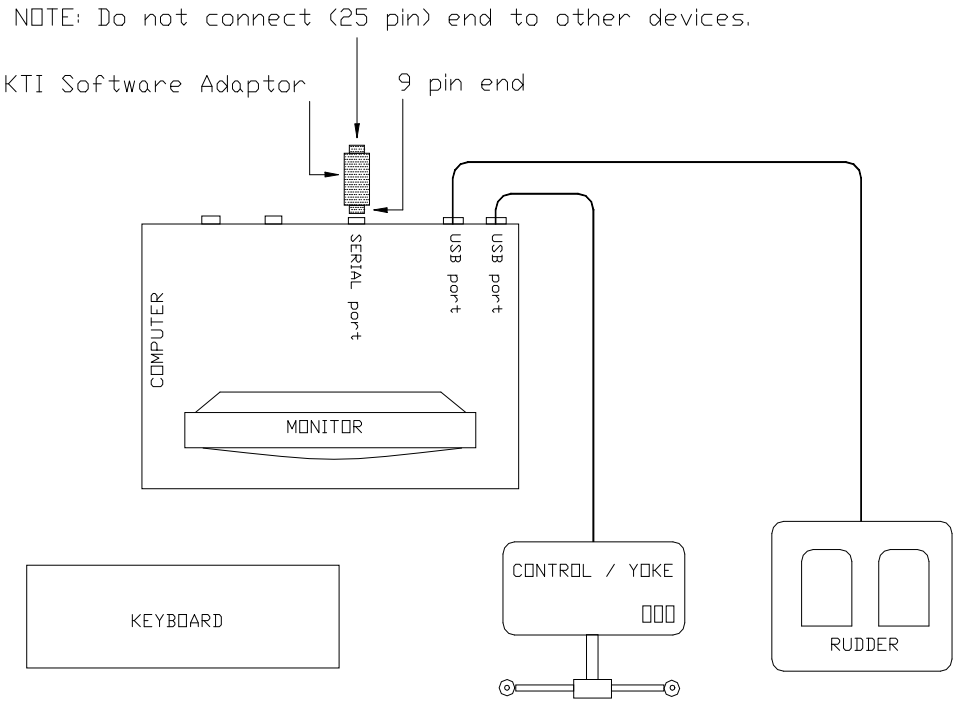


FIG. 1
CABLE CONNECTIONS.

Connect the *KTI Software-adaptor* (9 pin) end to COM. 1 or COM. 2 port, if no COMs ports are available use the "USB to Serial adaptor lead" supplied.
When using the USB to Serial adaptor lead first install the software driver supplied.
Now connect *KTI Software-adaptor* 9-pin end to the 9-pin end of USB lead, then connect USB end into computer.

Warning: *Do not connect any device to 25-pin end of the "KTI Software-adaptor".*
Note: The auto-detect feature will only work when the KTI software adaptor is plugged in.

LOADING THE PROGRAM.

Note: The MARK 4 version 4.0 is designed to run under Windows XP

Insert the Aeroguidance CD into the CDROM and wait for the installation program to load. If the auto-run is disabled for the current CDROM then use the following steps to begin installation.

1. Insert the CD into the CDROM
2. Double click on My Computer
3. Double click on the appropriate CDROM drive letter
4. Double click on the Setup.exe file to start the installation process
5. Follow the on-screen prompts to complete the installation

Once the installation is complete Aeroguidance will install a shortcut on the desktop and a shortcut in the Start Bar.
On first use, Aeroguidance will prompt the user for registration information.
Note: Be sure to enter details exactly as shown on the registration sheet provided.

Once registration details are entered in, Aeroguidance will open the Options window. The user will need to specify the resolution Aeroguidance will use to display graphics. Select an appropriate resolution to suite the graphics card/monitor of your system.

OPERATING PROCEDURES.

1. MAIN FLYING CONTROLS.

1.1 YOKE.

The trainer uses a conventional yoke assembly as the primary control of roll and pitch. It closely resembles the yoke of a conventional light aircraft and has the same sense, that is, clockwise turn produces right roll and yoke back produces nose up.

The sensitivity of the control is a function of airspeed where, although the controls do not become "harder" and have positive return-to-neutral at all speeds, as speed increases, they do become more sensitive.

The yoke incorporates two thumb-operated red push buttons and a rocker switch on the top of the left hand grip. The forward button engages the auto-pilot heading hold. The rear button engages altitude lock. Both are cancelled by the red button on the back of the left hand grip.
The rocker switch on the right of the red buttons controls elevator trim and is indicated on the screen.

2. TRIM.

A conventional trim wheel is also provided for elevator (pitch) trim. Rolling the wheel forward will produce nose down trim and rolling rearward will produce nose-up trim. However users will find the trim button on the left yoke handle more convenient.

3. ENGINE.

3.1 THROTTLE.

The throttle (large left hand knob) is conventional in operation and provides a means of setting power level. Because the trainer has a fixed pitch propeller, actual RPM will vary according to airspeed and altitude in the normal way. The idle position will always give zero power but the power available at the full throttle stop will vary from 100% downwards with altitude.

3.2 MIXTURE.

A mixture control is fitted - the smaller right knob (the middle knob is not used) which functions generally in the normal way. When in the cut-off position, no fuel will reach the engine which will therefore deliver zero power. If the airspeed is above Vs, the engine will continue to windmill but below Vs, it will stop. The engine is started simply by moving the mixture control to the full rich position. Assuming the throttle is retarded, an idle speed of 600 RPM will result. The trainer will not move on the ground in this condition.
Leaning the mixture should be done except in full power climbs below 5000 feet. At all other times the mixture is carefully leaned until a slight RPM drop is noticeable, then moved forward toward rich about 2-3 mm. Mixture should be readjusted whenever changing altitude and reset from time to time in cruise.
Note: The VDO will increment only when the engine is running.

4. FUEL.

Two wing tanks are fitted to the trainer with gravity feed. The engine draws fuel from both tanks equally.

Fuel capacity is sufficient for 180 minutes total time. If necessary, the trainer can be refuelled at any time by typing the command **fuel** on the keyboard. Fuel consumption is zero at idle and idle cut-off. Otherwise, it is constant.

5. FLAPS.

The flaps can be set to any angle between zero and 30 degrees. This is done with the flap control, which is the right hand centre off switch on the control box. Flaps down movement is by moving the switch downward and holding it until just before the desired setting is displayed on the instrument panel indicator (some over-travel is normal). Flaps up control is by moving the flap-switch up momentarily causing the flaps to fully retract. Less than full retraction can be achieved during up travel by momentarily pressing flaps down.

6. UNDERCARRIAGE.

An undercarriage control switch (to the left of the flap switch) is provided which allows the landing gear to be raised and lowered. Moving the switch to the UP position will initiate a gear retraction cycle and moving it to the DOWN position will initiate an extension cycle. In each case, indicators on the instrument panel will display the status. Gear down and locked is indicated by 3 green lamps, gear in transit is indicated by a single red lamp located below the 3 green lamps, and gear up and locked is indicated by all 4 lamps being extinguished. Gear cycle time is approximately 4 seconds during which airframe drag is slightly higher than in the gear extended condition. Drag is considerably lower once the retraction cycle is complete.

7. ADF TEST.

An ADF test button is situated on the rear of the right hand yoke. Pressing this button at any time will cause the ADF needle to rotate for as long as the button is held down. On release, the needle will return either to the 090 "parked" position or, if a valid NDB is tuned and within range, to the correct relative bearing.

8. KEYBOARD CONTROLS.

A number of functions, none of which are of an urgent or immediate nature, are actioned through the computer keyboard. In summary these are; Navaid tuning and using the GPS; Setting the Heading Indicator; Wind vector and turbulence set-up; . Screen change (to view plots); Pause facility; Stop-watch; Heading bug; Refuel; Reposition facility; QNH setting; Assigned Altitude ; . Simulating Failures; Quit (shut-down program).

9 NAVAID TUNING.

9.1 ADF.

The ADF is tuned by entering the NDB's published frequency through the keyboard preceded by an "a"; being the trainers method of indicating that the ADF is to be tuned. For example to tune the ADF to the Wonthaggi NDB, type:-
a383 [ENTER]
If the NDB is within range, the needle will assume its correct relative bearing. The ADF can be tested by pressing the ADF test button, situated on the rear of the right hand yoke

9.1.2 VOR or VOR/DME.

The NAV receiver with its associated DME receiver is tuned by entering the published frequency through the keyboard preceded by an "n"; being the trainers method of indicating that the NAV is to be tuned. For example to tune the Wonthaggi VOR, type:-

n115.9 [ENTER]

If the selected VOR is within range (a function of altitude), the localizer flag will disappear and the bearing indicator needle will assume a position relative to the OBS setting. If a DME is present, within range and with DME Hold OFF, it will present (slant) distance (NM), ground speed and time-to-station (Mins.).

9.1.2.1 OBS SETTING.

The Omni Bearing Selector (OBS) can be set to a particular value in much the same way as the station is tuned. In this case the required course value is typed in preceded by the OBS identifier "o". For example, to set OBS to 159 type:-

o159 [ENTER]

If, on the other hand, you want to ascertain your present position line, the OBS can be incremented through 360 degrees by repetitive pressing of the "]" and "[" keys for scan-up and scan-down respectively. Used alone, these keys produce 10 degree increments or, if used with the [SHIFT] key, produce 1 degree increments. Note that the OBS setting is indicated at the top of the dial face and the reciprocal is displayed at the bottom.

9.1.2.2 DME HOLD.

A HOLD facility is provided with the DME to enable it to remain tuned to a station while the NAV receiver is retuned to a different station. To toggle the HOLD either ON or OFF press the "h" key. This is an immediate control.

9.1.3 USING THE GPS.

INTRODUCTION.

The Global Positioning System (GPS) gives the user a continuous readout of the aircraft position at all times and, in addition, provides a navigation facility which allows the user to specify a waypoint (destination or en-route point) to which it is desired to track. The GPS will indicate the bearing and distance to that point, the time interval required to reach it at the current ground speed, and will indicate the aircraft position relative to the direct track on a Course Deviation Scale similar to a VOR CDI.

Five classes of waypoint (WPT) are available to the GPS, namely:-

Airports (APT)
Non-Directional Beacons (NDB)
VHF Omni-range (VOR)
Intersections (INT)
User defined (USR)

The last of these classes, the USR WPTs, are defined by the user and can be any point or place desired. A utility program is included with your simulator to enable the (off-line) creation, or modification, of user WPTs. Except for these USR WPTs, all others use the Australian standard idents.

THE GPS SCREENS (or WINDOWS).

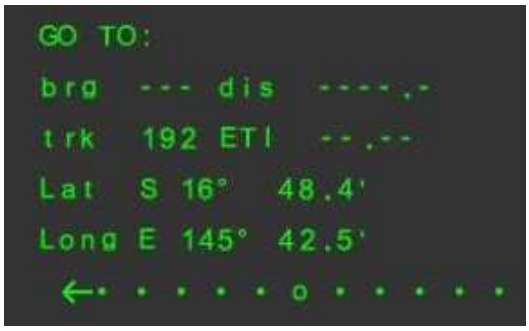
Three windows can be displayed one at a time. They are:-

Window 1. NAV display. (The normal window.)
Window 2. Nearest WPTs and pre-selection.
Window 3. Confirm pre-selection or specify other.

Selection of windows is in the strict order 1, 2, 3, 1 and is initiated by typing:-
g [ENTER] (for GPS)
from the keyboard and then just press Enter↵ to cycle through to Window 1 again. If no action is taken (ie. no keystrokes) for a period greater than 10 seconds when within Window 2 or 3, the display will automatically revert to Window 1 and no change to WPT selection will occur.

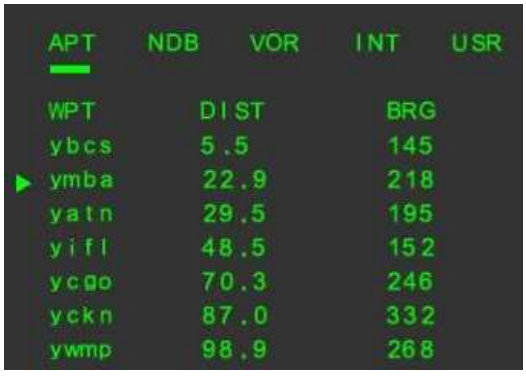
Window 1.

If no WPT has been selected the Brg, ETI, and Dis indications will be blank and the CDI scale will not display a pointer. If G/S is displayed in-lieu of ETI, it will indicate current ground speed irrespective of WPT selection. G/S or ETI display is toggled by pressing either the ↑ or ↓ keys.



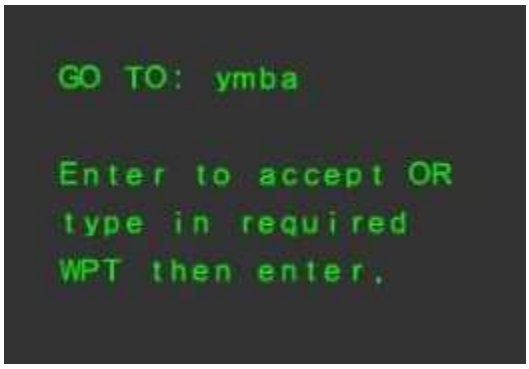
Window 2.

This window is used to find the nearest seven WPTs for each of the WPT classes. Pre-selection is achieved by first selecting the WPT class using the ← and → keys (VOR shown here) then using the ↑ and ↓ keys to select the actual WPT from the list displayed (in this example - WON) and then, within 10 seconds, press the ↵ key. If the WPT you want is not displayed, probably because it is further away than those displayed, simply press ↵ no matter which WPT is pre-selected then type your selection in Window 3.



Window 3.

In this window you can confirm the pre-selection from Window 2, (it will be displayed), by simply pressing the ↵ key OR you can over-type the pre-selection with another choice then press ↵. As soon as the ↵ key is pressed, the display will revert to Window 1 and, providing time-out did not occur, your new selection will be displayed along with the bearing, distance and Estimated Time Interval (ETI), and the CDI will be centred.



Note that the CDI scale represents, at its extremes, an off-course deviation of 5 NM. Each division therefore represents 1 NM off-course and off-course deviations greater than ± 5 NM are indicated by an arrow at the scale extreme indicating the direction in which *the pointer* has moved off-scale. The CDI sense is the same as that used in a VOR. That is, the aircraft must be turned toward the pointer to close the off-course error. Think of the scale centre as the aircraft and the pointer as the required course line.

Receiver Autonomous Integrity Monitor (RAIM).

A red lamp labelled RAIM will illuminate when integrity is "lost".

Cross track error Alert (X-TRACK).

An orange lamp labelled X-TRACK. Normally the lamp is off (greyed out), when the cross-track error reaches 7degrees the lamp turns ON and says on until the error drops to below 7 degrees.

ENTERING OR MODIFYING USER WAYPOINTS.

User WPTs may be entered, deleted or changed from the GPS Waypoint Editor. To access the editor click on Aeroguidance – Database - GPS Waypoint Editor menu item in the Aeroguidance start-up screen.

9.1.4 ILS or ILS/DME.

An ILS or ILS/DME is tuned using the NAV receiver in the same way as a VOR, eg. type:-

n109.9 [ENTER]

If the ILS is within range (25NM and ± 35º), both localizer and glideslope flags will disappear and the needles will assume their correct position. If an associated DME is present with Hold OFF, it will indicate distance (NM), ground speed (Kts.) to/from the station and time-to-station (Mins.). Check the ILS ident by pressing the audio panel NAV button. The Markers (MKRS) are automatically tuned with the ILS but the MKRS button on the audio panel should be selected to hear the marker audio on flying over the beacons.

9.2 COMPASS AND HEADING INDICATOR (HI).

Primary heading information is provided by the magnetic compass mounted top-centre in the panel. Ensure wings are level and the compass is stable before setting the HI, to ensure that turning and turbulence errors are minimised.
The HI will start-up on the heading last indicated when the trainer was shut down, however the trainer itself will be aligned due North (magnetic).
To set the HI (against the compass), press the "+/=" key to increase its reading (or rotate the compass card anti-clockwise) and the "_/-" key to reduce the reading. Used alone, these keys produce 10 degree increments or, when used with the [SHIFT] key, produce 1 degree increments. The HI will precess during operation. The "+/=" and "_/-" keys, with the [SHIFT] key, can be used to periodically realign it.

9.3 AUTO-PILOT

The Auto-Pilot fitted to VH-IFR provides HEADING HOLD and ALTITUDE HOLD.
In the HEADING HOLD mode, the trainer will couple to the heading bug on the AH. (Refer to section 9.8 for instructions on setting the Heading Bug.) ALTITUDE HOLD, which can only be engaged if HEADING HOLD is already engaged, will stabilize the trainer at the altitude at which it is engaged. Note, however, that if the trainer is not trimmed properly before engaging ALTITUDE HOLD, then a slow altitude creep will occur. To engage HEADING HOLD press the front red button on the left yoke handle. The HEADG. HOLD lamp will illuminate. To engage ALTITUDE HOLD press the rear red button after HEADING HOLD is ON. The ALTIT. HOLD lamp will illuminate. Both can be disengaged by pressing the button immediately behind the engage buttons on the rear of the yoke.

9.4 WIND VECTOR AND TURBULENCE SET-UP.

9.4.1 WIND.

Setting the Wind vector is easily done from the keyboard by typing the required vector preceded by the identifier "w". For example, to set a wind from 270 deg magnetic at 30 knots type:-
w270/30 [ENTER]
It is important to use the format exactly as shown; that is "w" followed by 3 figures for direction, followed by a "/" followed by 2 figures for speed. Wind can be zero'd by the short-cut method of typing:-
w0 [ENTER]

9.4.2. TURBULENCE.

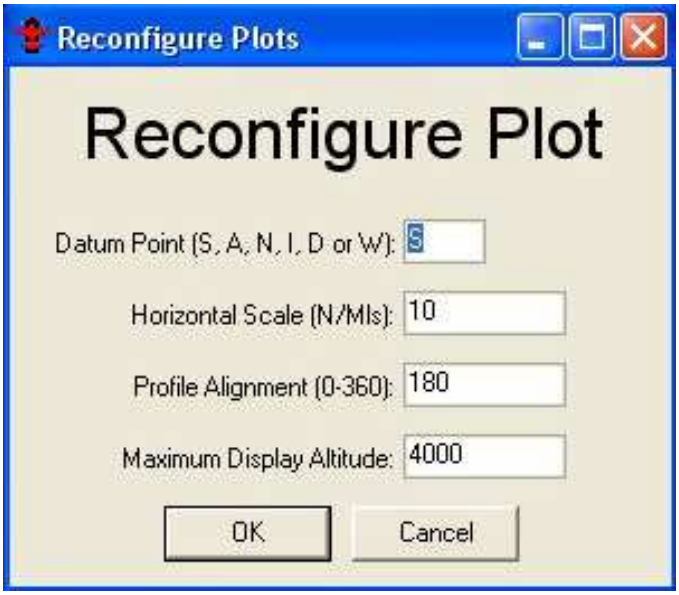
Turbulence may be simulated with increasing levels of severity ranging from zero (0) to high (9). Moderate turbulence can be set, for example, by typing:-
t4 [ENTER]

9.5 VIEW PLOT.

The trainer software retains in memory positional and altitude information for the flight.
At any time during or after an exercise, the track-made-good and the altitude profile can be viewed on the computer screen by swapping the instrument panel display and the plot display.
To move into the plot view (**s**creen change) simply type:-
s [ENTER]
The screen will now switch from the instrument panel to the plot. The track-made-good will be displayed (in red) in relation to any navaids tuned (up to 20) during the flight that are within the area viewed and centered, initially, on the start location. This TRACK plot will be scaled according to the figure nominated at start-up. The PROFILE plot, showing the trainer's flight profile appears (in red) on a horizontal scale equal to that of the TRACK, on a vertical scale of, initially, 4000 feet, and is oriented 90° to the horizontal to fit it on a single page.
To move back to the instrument panel, press the [ENTER] key again.
(Note that the trainer will "freeze" while the plot is displayed.)

9.5.1 RE-CENTERING AND SCALING.

To initiate re-centering and scaling press the F5 function key. The current screen will be replaced with a menu screen as below.



DATUM POINT permits the re-centreing of the plot to one of the *currently tuned* navaids or waypoint (WPT), or back to the original start location. Type S, A, N, I, D or W (representing Start, ADF, VOR, ILS, DME or WPT) or leave present setting (Start depicted above) then press [TAB] to move down to the next item or use the mouse to select the next edit position.

HORIZONTAL SCALE sets a radius from the datum point, which is displayed on the screenplot, and represents nearly a full screen. The value set can be any whole distance between 1 and 999 NM. Leave or change the value then press [TAB] to move down to the next item.

PROFILE ALIGNMENT sets an azimuth (in degrees magnetic) for the profile plot. Normally the final approach track bearing would be most useful and would allow reasonable comparison with the DAPs approach plate. Again, change or accept and press [TAB] to move down.

MAX. DISPLAY ALTITUDE sets the vertical scale of the profile plot up to a maximum of 9000 feet. Normally, this would be set to the nearest 1000 feet above LSALT for the approach to be examined. It can only be set in whole 1000's of feet. When this item has been set, press [ENTER] or click OK to activate the settings and return to the instrument panel.

NOTE: The plot displays the maximum and minimum altitude for the flight. At any time, they can be reset (to current altitude) by pressing the F8 function key. *It is important to do this at some point prior to commencing a procedure so that your altitude keeping can be accurately verified, particularly minimas.*

9.6 PAUSE FACILITY.

At times it is desirable to pause and examine just what is happening.
To do this, simply type:-
p [ENTER]
When ready to resume the flight, press any key on the keyboard.

9.7 STOP-WATCH.

A stop-watch is provided to enable accurate timing for timed procedures. This watch is coupled to the screen-change and pause facilities so that timing is not lost.
To start the stop-watch press the space-bar once.
To stop (and reset) the stop-watch, press the space-bar once again.

9.8 HEADING BUG.

The heading bug is controlled in 2 ways.
First the bug can be set by typing the desired value (as a 3 figure group) preceded by the identifier "b".
For example, to set the bug to -say - 097, type:-
b097 [ENTER]
Alternatively, the bug can be moved around the HI using single presses of the [>/.] key to move clockwise and the [</,] key to move anti-clockwise. Used alone, these keys produce 10 degree increments or, if used with the [SHIFT] key, produce 1 degree increments. This is very convenient for setting up intercept angles and returning to the wanted heading.

9.9 HSI FUNCTION.

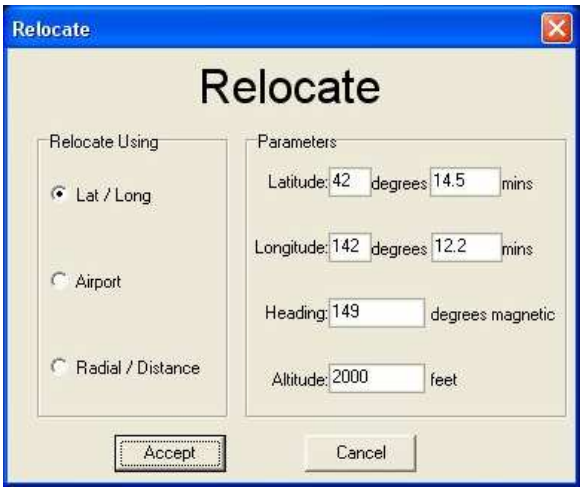
Instead of the HI which provides heading information and a bug only, and is subject to precession, a Horizontal Situation Indicator or RMI (HSI/RMI) can be activated. This function can be turned ON or OFF by typing:-
rmi [ENTER]
The HSI/RMI provides, in addition to heading information, NAV and ADF displays. The NAV display consists of an orange-coloured Omni Bearing Pointer with Deviation Bar, and a Glide-slope (GS) pointer, each with a corresponding +/- 5-dot scale. NAV and GS flags appear when the corresponding signals are invalid.
The ADF display consists of a green-coloured pointer head and tail (with no central section) which will indicate the direction to and from the NDB when in-range. Out-of-range indication is given by a constant 90° abeam indication.
A COMPASS flag will appear when the HSI/RMI reading is inoperative as a result of vacuum or instrument failure.

9.10 REFUEL.

The trainer has an endurance of approximately 180 minutes total shared between the two tanks.
It can be refuelled at any time (even in the air!) by typing the command:-
fuel[ENTER]

9.11 REPOSITION FACILITY.

This is a facility to enable a procedure to be recommenced from a specified location, altitude and heading. A reposition is invoked by typing:-
r [ENTER]
Two choices for repositioning are offered; viz. by entering latitude and longitude or by nominating one of the *currently tuned* navaids or WPT then specifying a bearing and distance from that aid/WPT. Following this position information, altitude and trainer heading can then be entered.



(Note that the trainer "remembers" the reposition data as latitude, longitude, altitude and heading. If you simply want to return to the previous re-positioning point - say - to retry an aborted approach, then nominate to enter latitude and longitude then Accept.

9.12 QNH

At start-up, the trainer sets a QNH of 1013 hP. This may be altered to some other value if desired.
To set QNH type "q" followed by 3 or 4 numerals. e.g. to set a QNH of 1023 type:-
q1023 [ENTER]

9.13 ASSIGNED ALTITUDE INDICATOR.

An Assigned Altitude window on the instrument panel displays whatever 4 figure number is entered. To enter an Assigned Altitude of 5000, type:-
5000 [ENTER].

9.14 SIMULATING FAILURES.

Provision exists to directly simulate the failure of various instruments. These are the gyro instruments (attitude indicator, Heading Indicator, and turn co-ordinator) and the glideslope.
To fail an instrument, the prefix "f" is used and to clear the fault, the prefix "c" is used.

fa will fail the Attitude Indicator.	**ca** will clear the fault.
fd will fail the DME.	**cd** will clear the fault.
fg will fail the Glideslope.	**cg** will clear the fault.
fn will fail the Nav receiver.	**cn** will clear the fault.
ft will fail the Turn Co-ordinator (not the ball).	**ct** will clear it.
fr will fail the RAIM	**cr** will clear the fault

To fail the ADF, the most convenient way is to tune it just off frequency.
Random failures can be selected in the Aero-Guidance main screen by clicking on “Modify” in the random failures section.

9.15 QUIT.

When the trainer is to be shut down, for example at the end of the day, the computer program should be terminated before powering down. This will ensure that things like VDO time, restart values and so on are correctly stored for subsequent use. Terminate the program by typing:-
q [ENTER]
The instrument panel will disappear and the screen plot will appear,

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STARTING THE TRAINER

1. Ensure that all plugs and cables are correctly and fully inserted in their respective receptacles.

2. Load Aero-Guidance by double clicking on the Aero-Guidance icon or though the start menu.

3. Check that the Control Console controls are set as follows:-

PRE-START CHECK LIST

GEAR.....DOWN
THROTTLE.....CLOSED
MIXTURE.....CUT-OFF
MARKERS.....SELECTED
YOKE.....CENTERED BOTH AXES
ELEVATOR TRIM ……CENTERED
RUDDER.....CENTERED

5. Select the starting details by clicking on the “modify” button in the Starting Details section.

   Respond to the prompts that subsequently appear in the appropriate manner. Enter in your departure airport and other prompts as they appear. One prompt requests a radius of operation. Type in a figure - say, 35 - that will cover the area of the exercise. Whatever radius is chosen can, however, be changed later as outlined in para 9.5.1 "RE-CENTERING & SCALING". Enter your name (or licence number) when requested, Another prompt, the last, will ask if you want a random failure. If you nominate yes, a random failure of the items selected will occur. No warning or advice is given.

6. The full instrument panel will now appear. The trainer is stationary, on the ground, and heading 360 deg Mag. It is located at either the Aerodrome Reference Point of the nominated aerodrome or at the nominated latitude and longitude.

7. Proceed now with the planned exercise or select one of the sample exercises.

SHUTTING DOWN.

It is important that shut-down is carried out in the correct manner to ensure:-

1. The current VDO reading is recorded properly.

2. Current trainer calibration settings are preserved.

3. Reinforces good shut-down practise.

PROCEDURE.

1. Type "q" (for quit) and ENTER. This action will cause the current settings for VDO, start Lat. and Long., relocate Lat. and Long., and control calibration constants to be recorded then will restore the computer to the desktop.

2. GEAR down
   POWER to idle.
   MIXTURE to idle cut-off.
3. Computer power off.

CRUISE PERFORMANCE SUMMARY.

Altitude	**Power / TAS**									
	Full-throttle	**TAS**	**75%**	**TAS**	**65%**	**TAS**	**55%**	**TAS**	**45%**	**TAS**
Sea level	Not Allowed	-	2300	127	2200	112	2050	112	1950	102
3000	2700	151	2550	134	2400	128	2250	118	2100	107
5000	2650	147	2600	138	2500	133	2350	122	2150	111
10,000	2400	133	-	-	-	-	-	-	2300	120
I.A.S.	-	-		127		122		112		102

Best Rate-of-Climb 85 KTS I.A.S.
Cruise Climb 90-100 KTS I.A.S.
Stall (Clean) 50 KTS I.A.S.
Never Exceed 178 KTS I.A.S.

APPENDIX 3.

SUMMARY OF KEYBOARD CONTROLS.

IMMEDIATE (No Enter↵ required)

FUNCTION	KEY	ACTION
HDG. IND. set	+/=	Alone, causes the HI to read 10° higher. With ⇑Shift causes the HI to read 1° higher.
	_/-	As above but reads lower.
OBS set	]	Alone, causes the OBS to increase by 10° With ⇑Shift causes a 1° increase.
	[	As above but causes a decrease.
DME hold	h	Toggles the DME between hold ON and OFF
BUG set	>/.	Alone, causes the BUG to increase 10° With ⇑Shift, causes a 1° increase.
	</,	As above but causes a decrease.
STOP WATCH	Space bar	Toggles the stop watch between counting up from zero and reset to zero.
AUTO PILOT - Hdg. Hold - Altitude Hold	Front red button Rear red button	The auto-pilot will couple to the Hdg. bug and turn the aircraft to this heading. Providing Hdg. Hold is ON, Rear red button will toggle altitude hold.
RECONFIGURE PLOT	F5	Brings up a menu which allows recentering, rescaling, azimuth and max displayed altitude to be changed.
RESET ALT. LIMITS	F8	Resets the MAX and MIN altitude recorder to the current altitude. Use before commencing approach. (Viewed on either plot.)
Ident Sound	F10	(Only last tuned navaid will sound) Toggles Morse ident sound between ON and OFF.

APPENDIX 3. (cont.)

NON-IMMEDIATE DATA ENTRY (Requires Enter↵ to accept)

FUNCTION	FIRST KEY	NEXT KEY(S)	ACTION
ADF	a	3 or 4 digits	Tunes the ADF to the frequency represented by the numerals after the "a".
NAV	n	e.g. 117.6 (must be in form 123.4)	Tunes the NAV reciever to the specified frequency e.g. 117.6 MHz. May be VOR, VOR/DME, VORTAC or ILS.
VOR	nv	e.g. 117.6 (must be in form 123.4)	Tunes ONLY the VOR indicator to the specified frequency e.g. 117.6 MHz. May be VOR, VOR/DME or ILS.
OBS	o	3 digits	e.g. o330. Optional method of setting the OBS. (See also immediate method.)
BUG	b	3 digits	Optional method of setting the Heading BUG. (See also immediate method.)
GPS	g	(none)	Enter↵ to cycle through each window. Use the number-pad arrow keys to select in Window 2.
ASSIGNED ALTITUDE	(none)	4 digits	e.g. 4000 or 0500 Sets the Assigned Altitude Indicator. Has no other effect.
QNH	q	4 digits	e.g. q1020 Sets QNH.
HSI	(none)	rmi	Type rmi to toggle the HSI function ON/OFF.
FUEL	(none)	fuel	Refuels the aircraft at any time.
WIND	w	5 digit vector	e.g. w090/05. Following the "w" must have 3 digit direction, a "/", then 2 digits.
TURBULENCE	t	0 to 9	e.g. t4 gives moderate turbulence.
FAIL - AI	f	a	Fails the AI Clear again with "ca".
- HI	f	h	Fails the Headg. Ind. Clear with "ch".
- T/C	f	t	Fails the Turn Co-ord. Clear with "ct".
- NAV	f	n	Fails the NAV Rx. Clear with "cn".
- G/S	f	g	Fails the Glideslope. Clear with "cg".
- DME	f	d	Fails the DME. Clear with "cd".
- RAIM	f	r	Fails RAIM on the GPS. Clear with “cr”.
VIEW PLOT	s	(none)	View the Track and Profile plots. Enter↵ to return to the panel.
REPOSITION	r	(none)	Menu appears to permit reposition of A/C.
PAUSE	p	(none)	Freezes the program. Hit Enter↵ to continue.
QUIT	q	(none)	Terminates program. returns to Windows.

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