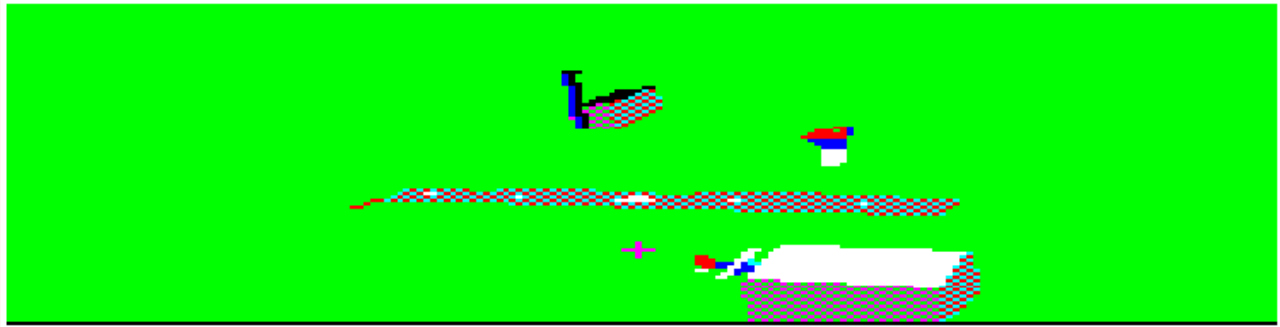# THE

SIMULATOR

Sinclair QL

EKOTEK
DATASYSTEMS

Transcribed from the original by I.R.BURKINSHAW

THE SIMULATOR

This flight simulator has been developed for the SINCLAIR QL range of computers. It has been tested with the following configurations:
- Sinclair QL with JM ROM, 128k RAM and 2 microdrives.
- Sinclair QL with JS ROM, 128k and 640k RAM, 2 microdrives and Cumana disk interface with 2 Floppy drives (5.25").
It is our strong belief that no problems will be encountered with similar setups or with computers with AH or MG rom sets. Problems can be encountered with the THOR range or the QDOS system for the ATARI ST, because of direct hardware access and use of the KEYROW() function. Therefore we do not guarantee proper behaviour of the program on these systems. Also the programs will only work properly on QL's with a PAL display system (512x256 and 256x256 pixels).

Of course we want to keep on improving it. You could help by sending your comments and suggestions. Futhermore we will develop mores WORLDS with different objects. The first cartridge will be published early 1989.

ACKNOWLEDGEMENTS.
Aeroplane simulation, Real-time graphics, Scenery data, drawings, additional utilities and routines, and the manual were written and produced by Mr R.J. Stekelenburg M.SC.
Special thanks go to MR J.C. Slabbekoorn M.Ed. For testing the software and for his valuable comments on both software and manual.

Parts of the software were written in SUPERBASIC and compiled with Qliberator V 3.13. Qliberator is a product of Liberation Software, UNITED KINGDOM.

TABLE OF CONTENTS

APPENDICES

1. **<u>INTRODUCTION</u>**

Welcome to THE SIMULATOR
You have bought this program because you are interested in FLIGHT SIMULATION, or maybe in real-time graphic or because you just want to be entertained. Some of its features are:

– Simulation of an imaginary light aircraft.
– Realistic Cockpit instruments.
– Real-time graphics representing the outside world in 3D.
– View of the outside world in four directions in black&white or in full colour (52 colours in all).
– Three levels of difficulty.
– Report facility giving information on flight time, total distance flown, fuel consumption and more.
– Different worlds cam be loaded from cartridge or floppydisc. Each world has up to five airways and contains many objects to aid orientation during the flight. Special cartridges will be on offer in 1989.

We want to stress that the program is primarily meant to play and have fun with, NOT to learn how to fly or to train your capabilities as a pilot.
Before proceeding with the software, you need to take notice of the following: The original microcartridge contains all the program and data files, including a compressed version of the COCKPIT screen.
The first thing you have to do is to make one or two copies using the CLONE program. The cartridge is copy protected, but for backup purposes you can make upto five copies. This should be enough for your personal use (and that is the condition under which we sell our programs!). If you make a copy on microcartridge you will need an empty one which will contain the program and the data files.
More details in the following chapter "Making Copies". Make sure you read it before you make your first copy.
We suggest that you read this manual entirely before you climb into the pilot's seat. If you are very impatient however, then start-up the program and read chapter 3. Then glance through chapter 4 so that you will have an idea of the working of the instruments and the controls. If you think that you understand enough, go to chapter 5 were you are guided through your FIRST flight. Don't be afraid to CRASH, it will happen often to you in the beginning!
HAVE FUN NOW...!

2. **<u>MAKING COPIES</u>**

This is the first thing you have to do after you unpacked.
You will need one microcartridge (210 sectors minimum) or one floppy disc. It will be formatted, so be sure it does not contain important material! If you use a cartridge it will only hold one single world data file (WORLD1_DAT). If you can spare another cartridge to hold data files, then go to section B after you have made your copy.
In order to make successful copies of this program you need two functioning microdrives OR at least one working MDV and a floppydrive system! If you have two Microdrives which cannot read or write eachother's cartridges (we own such a QL!) then proceed with section C.

A. The Copy procedure for ONE CARTRIDGE:
1. Turn the QL on or RESET it.
2. Put the ORIGINAL cartridge in MDV1_
3. Press F2 to boot the cartridges
4. If all is well you will first see the Qliberator copyright message and after a while the CLONE PROGRAM starts.
5. A window will appear with the headed 'CLONE PROGRAM'.
6. If you now have the original cartridge in MDV1_ and want to use MDV2_ to copy to, you can give 'ENTER' to the following two options. If you use a different setup e.g. original in MDV2_ and copying to MDV1_, then follow the onscreen instructions carefully.
7. Next you will see a screen giving the setup you use. Read it carefully and be sure that the device that is going to be FORMATTED does **NOT** contain the original cartridge. When this is oke press Y to confirm. If all of this sounds difficult at first: the program is actually selfexplanatory and nothing can go wrong if you follow the instructions carefully.
8. In some cases you might get the following message on your screen during the COPYing process:
    JOB 1   FORMAT
    QLIB ERROR IN USE
    RETRY   Y/N
    If this is the case then wait until the microdrive stops running, then press Y.
9. After the formatting procedure you will see how many copies you made so far including the last one. You can make up to five copies and the program will warn you if you are making your last copy. Next you will see which files are copied.
10. When copying is done, mark the cartridge or floppies. You can now RESET your computer and start FLYing!

B. The Copy procedure for TWO CARTRIDGES:

With two cartridges you will have the program files on one (and BOOT from it) and the data files on the other. The DATA cartridge contains _DAT files (Scenery and object files) and the COCKPIT screen. Then follow the next steps:

1. Follow the steps 1 to 9 from the Copy procedure for one cartridge (section A).
2. Reset your QL and press F1 or F2.
3. Insert the copy in MDV1.
4. Insert your DATA cartridge in MDV2. Remember the the _DAT files take up about 24 sectors each and that the COCKPIT_scr files is 64 sectors long. So each cartridge can contain about 5 to 6 _DAT files. If there isn't room then format the cartridge first.
   Important: on a cartridge or floppy that contain DATA, there must be at least 5 sectors of free space.
5. Now enter:
      COPY MDV1_COCKPIT_SCR TO MDV2_COCKPIT_SCR
      COPY MDV1_WORLD1_DAT TO MDV2_WORLD1_DAT
   Then type:
      LOAD MDV1_BOOT
      EDIT 110
   and change line 110 in:
      110 Dev2$='MDV2_'
   Then :
      DELETE MDV!_BOOT
      SAVE MDV1_BOOT
6. Remove the cartridge from MDV1_ and insert in its place the Original Cartridge.
   Type:
      COPY MDV1_NIGHT1_DAT to MDV2_NIGHT1_DAT
7. Remove both cartridges and keep the original in a safe place.
8. When copy is done, mark the cartridges. From now on you will use two cartridges when running THE SIMULATOR: the BOOT cartridge in mdv1_ and the DATA cartridge in mdv2. You can now reset your computer and start FLYing! When the program has started you can remove the BOOT cartridge if you want, **but never remove the DATA cartridge.**

C. **What to do in DIFFICULT CASES?**

I. You have only one (properly) working microdrive and one or two floppydrives.

Put the original cartridge in MDV1 or MDV2 respectively and give a DIR command. If the cartridge gives a normal directory on MDV1 you can boot and run the CLONE program from this drive in the way described above.

If, on the other hand it can only be read by MDV2 you need to start the CLONE program by hand: Put the cartridge in MDV2, then type LOAD MDV2_BOOT <ENTER>.

If the cursor appears type LIST and change all occurrences of MDV1 in the program to MDV2. Then type RUN and go on with the item 4 from section A above.

II. You have two working microdrives, but they cannot read each others tapes?

Try to find out which MDV can read the original best by putting it in either MDV and give the DIR command. Now load the Boot program by typing LOAD MDV(1 or 2)_BOOT. If the original can only be read by MDV2 then change all occurrences of MDV1 in the BOOT program by MDV2 and type RUN.

Now Follow items 4 to 10 from section A above.

Remember that you can always copy the datafiles from one device to the another, but not program files.

D. **Summary**

After copying you have:

(A) either one (BOOT and DATA) cartridge in MDV1_ containing:

    - Boot   - World_obj
   - Qlib_run   - World1_dat
    - Model_obj   - Cockpit_scr8

or (B) two cartridges,

    the BOOT cartridge in MDV1_   AND   the DATA cartridge in MDV2_
    containing: - Boot   containing: - WORLD1_dat
                     - Qlib-run   - NIGHT1_dat
                     - Model_obj   - COCKPIT_scr8
                     - World_obj

3. THE COCKPIT INSTRUMENTS

In this chapter we will discuss the different instruments, and learn how to use them. In figure 3.1 you see a schematic view of the COCKPIT screen. Compare this to your monitor or TV screen if you have the program running.
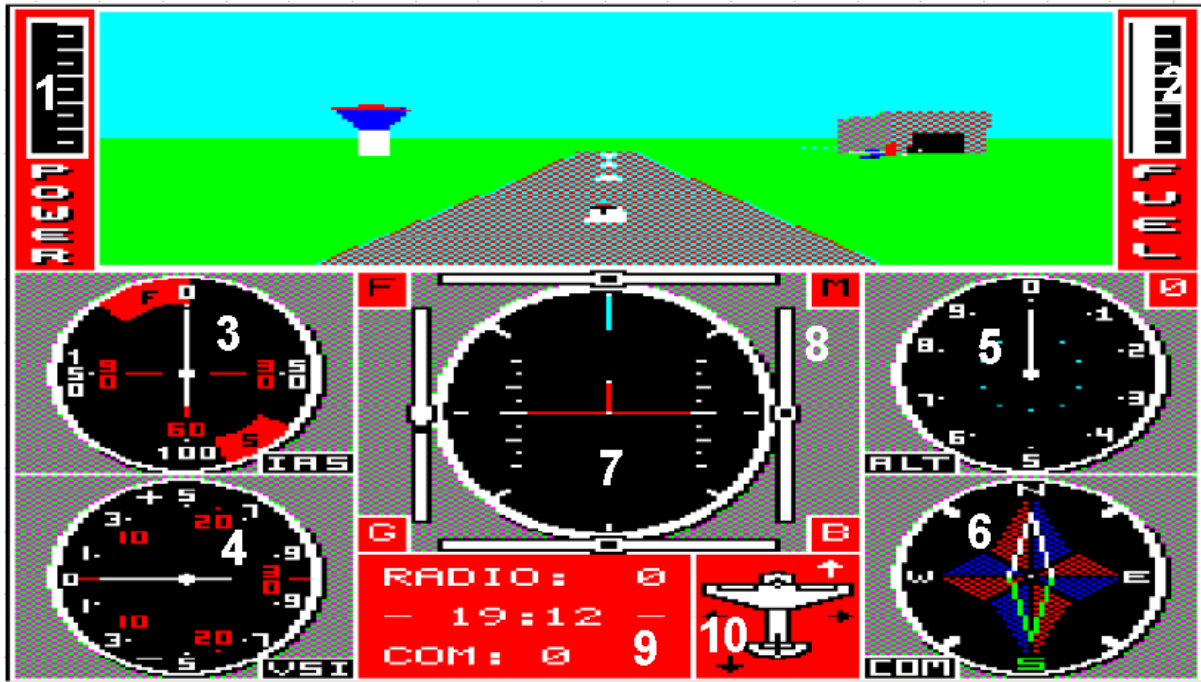
1. Power	6. Compass
2. Fuel	7. Artificial Horizon (ATH)
3. Airspeed	8. Indicator surrounding ATH
4. Vertical Speed	9. Radio/Clock/Compass
5. Altitude	10. View direction

Fig 3.1 Schematic view of the cockpit.

We will now discuss the instruments in the numerical order in which they are shown in the above figure.
If you do not immediately understand the full working of an instrument, when watch it carefully during your flying exercises, try to influence it with the controls and reread the text if necessary.

1. POWER indicator [0-100%]

This instrument display the actual power that is generated by the airplane's engine. This 'actual or effective power' comes free when a mixture of air and fuel burns (or actually explodes!) in the engine and produces energy. If you fly at high altitudes the power will drop, because the rarefied air will decrease the effectiveness of the engine. At some altitude about groundlevel the maximum actual power will not reach 100% anymore. The fuelconsumption however will still be the same as with maximum power at ground level.
Note: A power level of less then 10% is too small to exert a forward pull on the aeroplane.
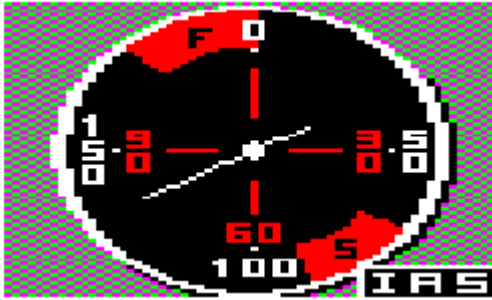In the example the actual power is at 50%.

2. FUEL meter [0-100 Liter]

This meter shows the amount of fuel left in the fuel tank. The white bar will blink if the capacity sinks one-fifth (20 Liter) of a full tank. Dashes are shown at 10 liter intervals.
The example shows that the tank has 68 Liters.

3. Inertial Air Speed indicator [0-200 km/h]

This indicator displays the IAS or Inertial Air Speed. The IAS is the speed of the aeroplane relative to the airmolecules. The groundspeed (i.e. the speed relative to the ground) is equal to IAS only if the plane flies horizontally and when there is no wind. As an example, suppose the plane flies exactly horizontal and there is a wind coming from behind. If the aeroplane's IAS is 100 km/h and wind is blows with a velocity of 15 km/h then the resulting ground speed will be 100+25=125 km/h. If this same wind would blow from the front then the ground speed would become 100-25=75 km/h. The outer ring of (white) numbers indicates kilometres per hour (km/h). The inner ring (red numbers) shows the IAS in miles per hour (mph). You also see two red area's one near 100km/h(60mph) marked 'S' and the another near 200 km/h (same as 0 km/h) marked 'F'.
The first area indicates STALL speed. When the hand of the instrument points to a speed below this red marking (i.e. near 50 km/h) then your speed is too low to keep the plane in the air. You will hear the STALL warning, and the plane will descend faster and slant. To get out of this situation give more power until the IAS is 'out of the red mark'.
The second area indicates MAXIMUM speed. It is only valid in levels 1 and 2. When your flaps are 'in' your MAXIMUM speed is 200 km/h (the hand will point to the 0). If they are 'out' then be sure the speed does not reach the red area. There is no recovery possible when you have exceeded the maximum speed. A immediate crash will be the result.
In the example the IAS is 135 km/h

4. Vertical Speed Indicator   [+/- 0-10 m/s]

The VSI instrument gives the amount of lift (+) or descend (-) perpendicular the the ground (horizon). The outer ring of (white) numbers gives the VSI in meters per second (m/s). The inner ring (red numbers) shows feet per second (fps).
The descend speed should not exceed -3 m/s at the moment you hit the ground during the landing.
In the example the VSI indicates a climb speed of +2 m/s.


5. Altitude Indicator   [0-9999 m]

This instrument gives the altitude of the plane above ground level (in meters).
You read it as follows: The number in the upper right corner indicates thousands of meter. The short hand of the instrument indicates hundreds of meters and the long hand indicates tens of meters. In the example the long hand is at 10 meter, the short hand is slightly beyond 500 meter and the number is 0. So we conclude that we are at a height of 510 meter above the ground.
The theoretical ceiling (i.e. maximum altitude) of the aeroplane is 10000 m (30000 ft). At that point the actual power will be zero. In practice you can never reach it, because long before this point the actual power will be to small to sustain any climb. Normally though, the fueltank will be exhausted.
The instrument has no indication for feet, but remember that 1 meter = approx. 3 feet. See Appendix 1 for conversion tables.

6. COMPASS [0-360 degree]
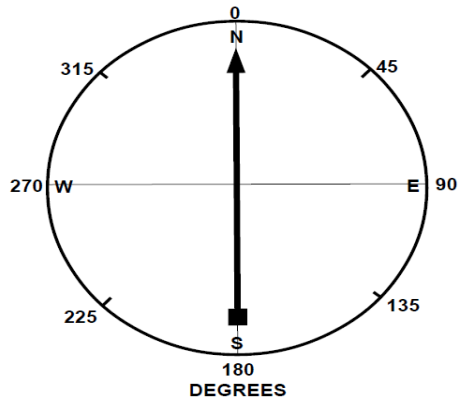
This instrument is not meant for an exact reading of one's bearing, but for giving an approximate idea of the direction in which you are flying. The bright end of the needle points to the north. Note that the graduation is clockwise. Compare it to the graduation on the map (appendix 3) and try to understand why there is a difference.

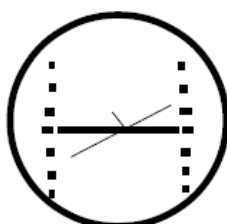The example shows a direction of 150 degrees or approximately South-East.
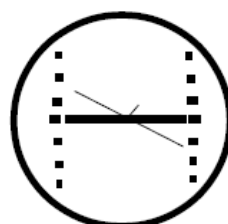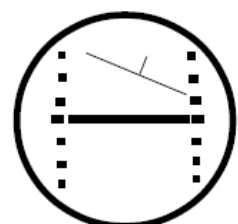
7. ARTIFICIAL HORIZON
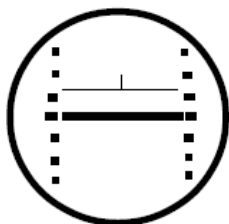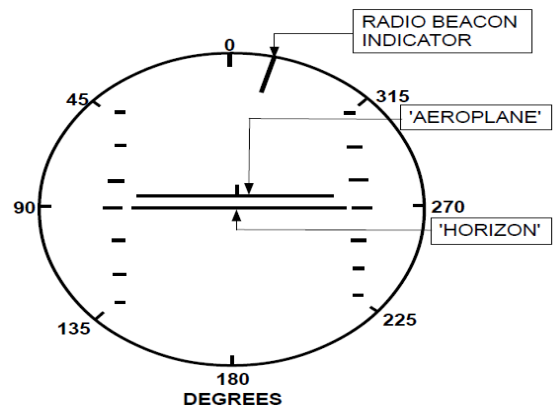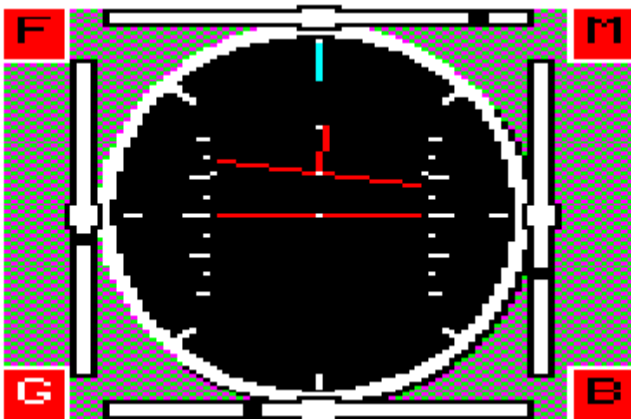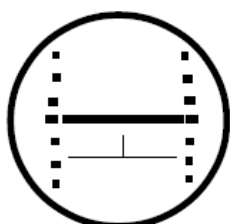
We discuss here the circular instrument only. The surrounding indicators are dealt with in part 8. The long horizontal line in the middle of the instrument depicts the horizon. The other long horizontal line forms,together with the short vertical line, a picture of the aeroplane (you 'see' the front wings and the tail). The instrument shows the angle the aeroplane has with respect to the horizon. So when your 'nose' is down, the aeroplane on the ATH will be below the horizon. This will normally mean that you are descending. When you climb, (i.e. 'nose' up) the plane will be above the horizon. Look carefully at the examples given and try to understand them. NOTE: The meaning of climb and descend with respect to the indication on the ATH is relative. For example, if the aeroplane's nose is up (positive elevation), you can only gain height if the speed is high enough. Likewise, when the nose points to the ground, you can still climb, if the airspeed is very high. The two columns of small dashes indicate the angle of 'climb' or 'descend'. Each dash represents 5 degrees.

Near the other radius of the ATH you find a short line. This line indicates the direction of the radio beacon you selected last. Note that it is not automatically updated. See also item 9 below.

8. Indicators surrounding ATH
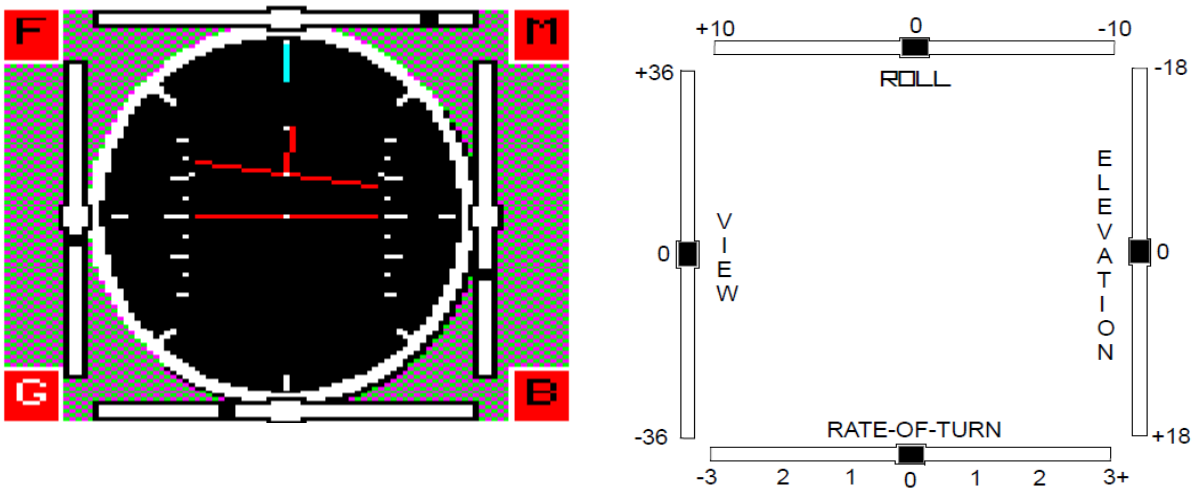
 We will discuss the bars first, starting at the left, going clockwise:

A. Direction of view, up/down (Left of ATH). As you can learn from chapter 4, you can change the direction in which your head is turned. The black spot in this bar shows you the direction of your line of view with regard to the plane. You can move your direction of view up (looking towards the sky) or down (looking towards the ground) in steps of 3 degrees.

B. <u>Roll indicator (above the ATH).</u> This shows the position of the yoke to the left or right in steps of 1 degree. The black spot turns to red when the yoke has a deviation of more then 10 degree's.
C. <u>Elevator indicator (right of ATH.</u> This indicator shows the position of the elevators. This is also controlled by the yoke. It shows the up or down deviation in steps of 1 degree.
D. <u>Rate-of-turn indicator (below ATH).</u> This shows the rate of turn in steps of 1 degree per second. Its implementation is such that it points to the opposite of the direction in which you are turning.

The other indicators are pictured as black or white characters on a red background. We start at the upper left, going clockwise.

<u>Flaps</u>
    Black F: Flaps are in, There is no influence on the plane's flying characteristics.
    White F: Flaps are out, this situation will lower your speed and as a result decreases the vertical
          speed.

<u>Map</u>
    Black M: Map is off. The cockpit window shows the normal view of the outside world.
    White M: Map is on. The cockpit window will show a map of the area you are flying above.

<u>Brakes</u>
    Black B: Brake is off.
    White B: Brake is on. The wheels are set tight. If you where moving on the ground your speed
    would rapidly decrease. If are already standing still, you will not be able to move until you
    release the brake.
The position of the brake has no influence during the flight.

<u>Gear (Undercarriage)</u>
    Black G: Gear is up, While you are on the ground you cannot retract your gear. During landing
          you will crash is you hit the ground with your gear up.
    White G: Gear is down. This is normal when you are on the ground and during landing. During
          the flight it will cause extra friction and subsequently a lower speed.

9. RADIO / CLOCK / COMPASS

This part of the screen shows some additional and important information.
From top to bottom:
The first line indicates the radio beacon you selected last. The direction of this beacon is shown in the ATH, see there.
In the middle is the clock time (24 hr scale). When you boot the program, you are given the chance to set this time to your requirements.
The last line shows a more exact reading of your compass bearing. You can use it in accordance with the graduation on the world's map.

10. View direction (roundabout)

The small figure depicts the aeroplane you are flying. It shows the four direction in which your line of sight can be. The controls enable you to look through one of the side windows, the rear window (with you head turned backwards on your body!) or to the front as in this example.

So far for the cockpit and its instrument panel.
The next chapter will deal with the way you can control the aeroplane. If you've read that (or at least glanced through) you are ready for your first flight!

4. **CONTROLS (THE KEYBOARD)**

In this Chapter you will learn all keys and combinations of keys that are needed to control the aeroplane, look at the map, load new worlds and more …
We recommend strongly that you use a JOYSTICK when possible. It adds more realism when used as a steering-column or yoke than the keyboard an give. However this is a matter of taste (and money too). In the rest of this chapter we assume you have a joystick attached (in control port CTL 1). For those who are not using one, here are the equivalent keyboard controls:

JOYSTICK:		KEYBOARD:
JOYSTICK to the LEFT	→	LEFT cursor
JOYSTICK to the RIGHT	→	RIGHT cursor
JOYSTICK FORWARD	→	UP cursor
JOYSTICK BACKWARDS	→	DOWN cursor
FIRE BUTTON	→	SPACEBAR

We have subdivided all possible controls into the following categories:
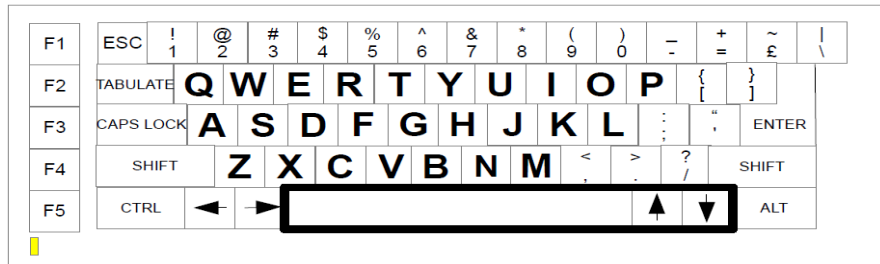
      A. COCKPIT CONTROLS
      B. VIEW DIRECTION CONTROLS
      C. MISCELLANEOUS

For a concise summary of controls see Appendix A1.
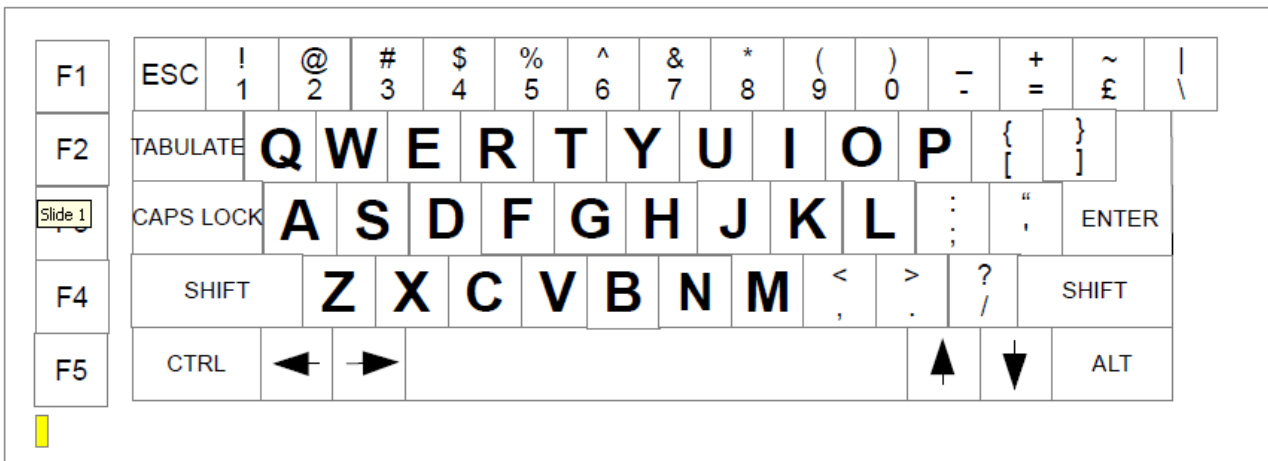
A. COCKPIT CONTROLS

POWER

More POWER: Press FIRE button and move stick forward
(Press SPACE together with UP cursor)
Less POWER: Press FIRE button and move stack backwards
(Press SPACE together with DOWN cursor)

Remember to press the FIRE button (SPACE) first and then add forward (UP cursor) or backward (DOWN cursor. To leave this control, first center joystick (release cursor key) and then release FIRE button (SPACE).

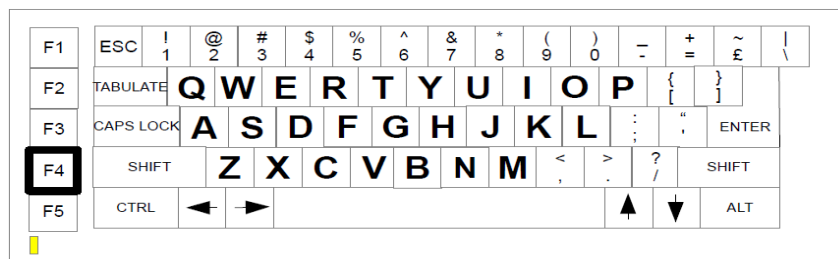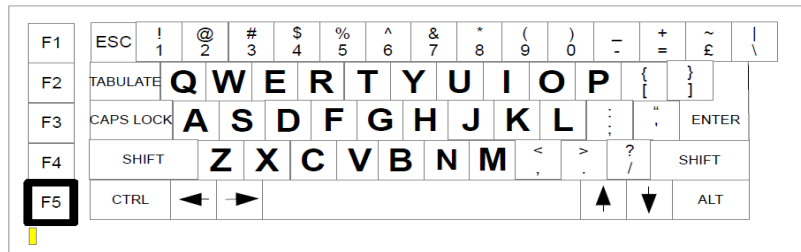---

BRAKE
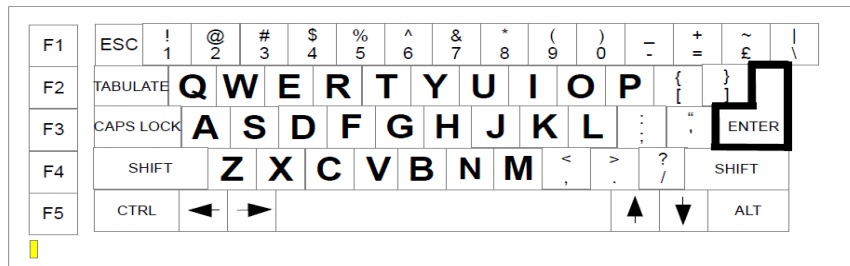
BRAKE on: Press ENTER until WHITE 'B' appears
BRAKE off: Press ENTER until BLACK 'B' appears

GEAR (Undercarriage)

GEAR up   : Press F4 until BLACK 'G' appears
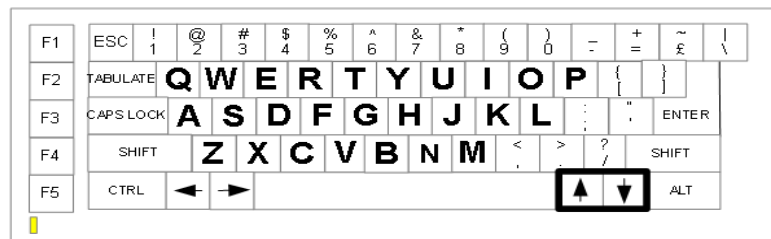**GEAR down:** Press F4 until WHITE 'G' appears

FLAPS

FLAPS in : Press F5 until BLACK 'F' appears
FLAPS out: Press F5 until WHITE 'F' appears

ELEVATION
(Up/Down movement)

Moving upwards (Climb): Joystick backwards towards you)
(DOWN (!) cursor key)
Moving down (Descend) : Joystick forward
(UP (!) cursor key)

This controls the ability of climb or diving (i.e. descending) with your plane. Note that this is not absolute, e.g. whether you can climb or not also depends on your speed and thus on the amount of power you give.
Note: Small changes of rate of climb or descend, can be controlled better by changing speed (IAS) of the aeroplane.
The speed is influenced by the altitude at which you fly, the amount of (effective) power and whether or not you have your flaps out or gear down.

ROLL
(left/right movement)
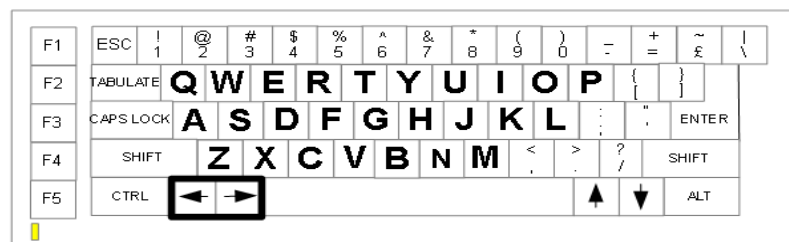
Move LEFT (Left turn):   Joystick to the left/LEFT cursor
Move Right (Right turn): Joystick to the right/RIGHT cursor

These controls enable you to steer and change your direction. The effect is different depending on the level you are in or whether you are in mid-air or on the ground.

GROUND movements: When on the ground turning to the left or right will only be possible when you have a certain amount of speed. So be sure to have your brakes off and to have enough power (about 20% will do for normal TAXIing).

AIR movements: When you make a left or right turn, you will see the left/right position of the yoke change. The rate-of-turn indicator will also move. Next the ATH will be slanted instead of horizontal, just like the horizon outside the cockpit window.
There is some difference between the levels of difficulty:
– LEVEL 0: The rate-of-turn is proportional to the position of the yoke.
– LEVELS 1 and 2: The position of the yoke is now equal to the amount with which the rate-of-turn will change.
   In this mode it is very easy to oversteer i.e. to give to much ROLL. Give only small deviation from the mid or neutral YOKE position. See also YKOE neutral control (next). The turnrate also depends on the airspeed: the higher the IAS, the faster your rate-of-turn will change.
If you have trouble fully understanding this, just try it out!

YOKE NEUTRAL
(left/right only)
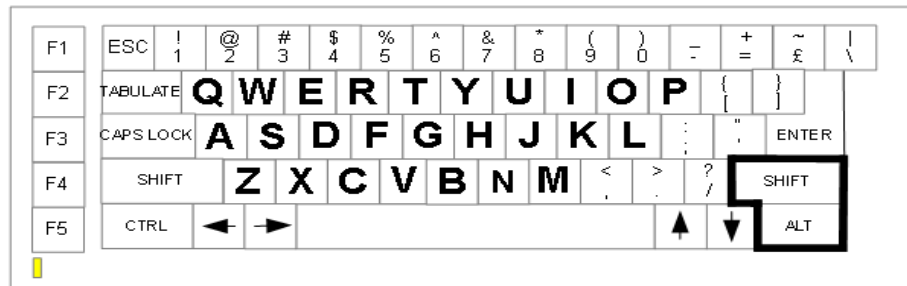
   YOKE in neutral position: Press ALT and SHIFT keys together.

This control immediately centers the YOKE to zero position. You will find it especially handy in levels 1 and 2.

RADIO BEACONS
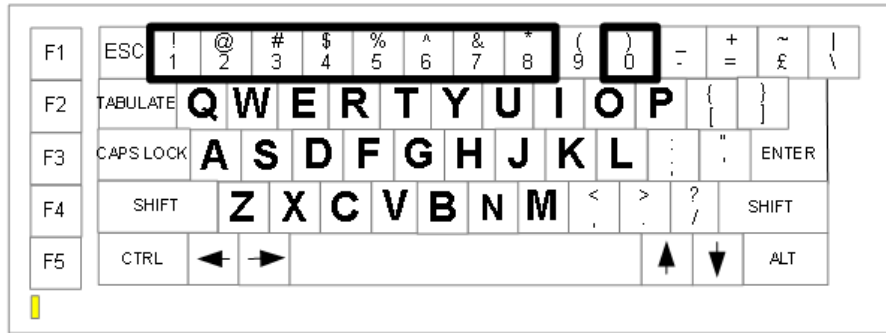
Select a radio beacon: Press a number from 0 to 8 until it shows on the display.

The direction of the beacon will only be updated as long as you press the key. If you release to key, the direction indicator will 'freeze'.

B. VIEW CONTROLS

MAP facility
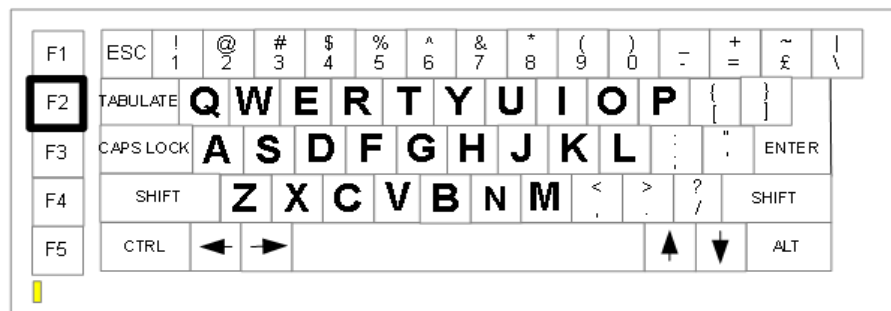
MAP on: Press F2 until a WHITE 'M' appear
MAP off: Press F2 until a BLACK 'M' appears

With this control you can select the MAP facility. When it is on you will have a view of the scenery as if you were looking down, through the bottom of the aeroplane. You can zoom this view in and out, making it larger or smaller (see next item).

ZOOM IN/OUT
(Only when MAP is on)
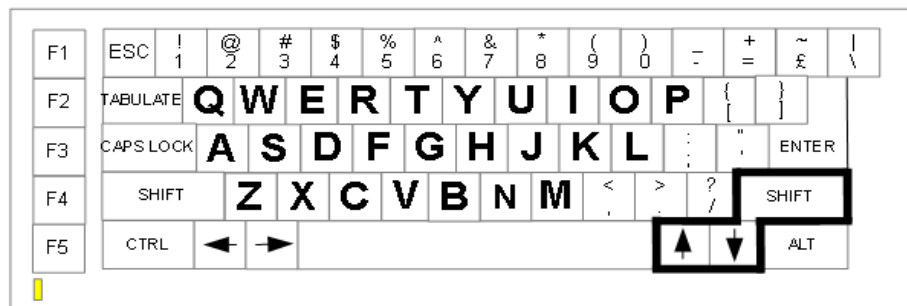
ZOOM in: Press SHIFT and DOWN cursor once
ZOOM out: Press SHIFT and UP cursor once

This control has the same effect as a ZOOMlens on a camera. It enables you to enlarge or reduce your angle of vision.

VIEWANGLE
(roundabout)
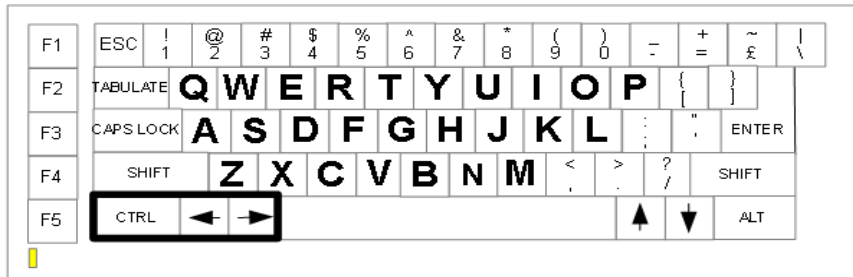
Change roundabout viewangle: Press CTRL and LEFT or RIGHT cursor key

The WHITE arrow around the small aeroplane will show you in what direction you are looking (forward, backward or either side).

VIEWANGLE
(up/down)
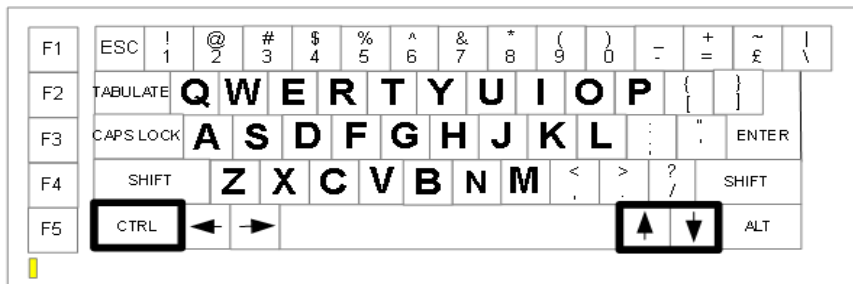
Change VIEW up/down: Press CTRL and up or down cursor key

The indicator left of the ATH will show in which direction (up or down downwards) you are looking.

VIEWANGLE NEUTRAL
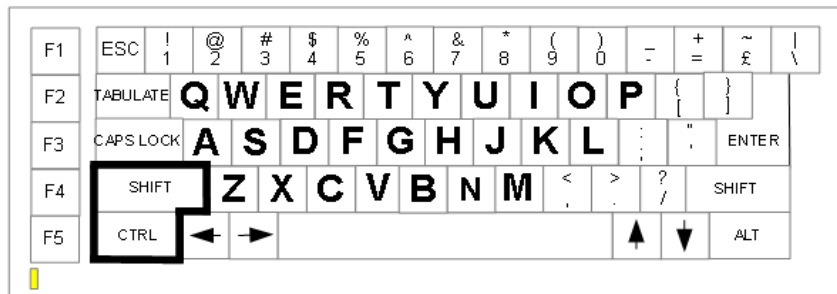
Set VIEWANGLE neutral: Press CTRL and SHIFT key together

This sets the up/down viewdirection in a neutral position i.e. 6 degrees out of line with the plane's main axis.

C. **MISCELLANEOUS**

COMMANDS
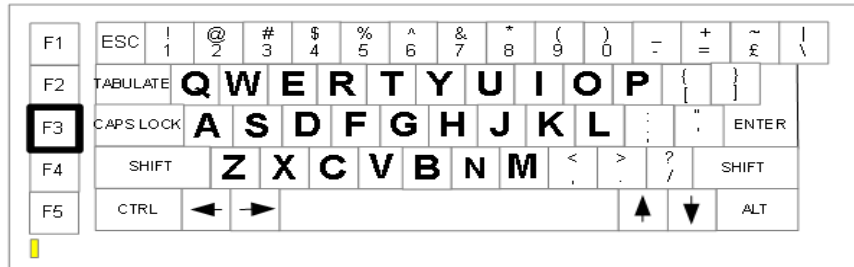
        Select commands: Press F3

If you choose the extra commands you will hear a BEEP and see the following screen:

> COMMANDS:
>   W …. LOAD WORLD
>   L …. SET LEVEL
>   R …. REPORT
>   M …. CHANGE MODE
>   Q …. QUIT COMMANDS

If the screen disappears or only shows partly press F3 again.
Now press the appropriate letter (W, L, R, M or Q) to enter a command.
All commands except for 'REPORT' or 'QUIT' will return the state of the simulation to initial conditions i.e. back to the start of a runway.
We will discuss one by one.

LOAD WORLD

You will be presented with a list of all the worlddata (_DAT) files on the data cartridge, with five names fitting on the screen at any one time. Select one of the numbers in front of the names or press 'C' to continue, if there are more files or when you want to quit without making a choice.
After you have chosen a new world will return to the COMMAND screen.

SET LEVEL

The following screen will appear:

SET DIFFICULTY LEVEL:
       LEVEL IS NOW: 0
       WIND VELOCITY: 0   (in km/h)
       WIND DIRECTION: 0
       [Set Airfield: Key F1 .. F5   (1)]**
       Set level: Key 0 .. 2
       PRESS Q TO QUIT

                    ** Only in level 1 or 2

You can now select the level of difficulty by pressing keys '0','1' or '2'. If you are in level 1 or 2 you can also choose which airfield you want to depart from. In level 2 you will see that the wind is playing a role in making flying more difficult. This is the only difference between level 1 and 2. The difference between level 0 and 1 or 2 is that steering in higher levels is much more difficult. Pressing 'Q' returns you back to COMMAND level.

REPORT

The following screen appears (the values may be different):

       FLIGHT INFORMATION
       FUEL USED   : 10 Ltr
       FLIGHT TIME   : 10 min.
       FUELCONSUMPTION   : 60 Ltr/hr
       TOTAL DISTANCE   : 5 Km
       POSITION X-COORDINATE : 10.3 Km
               Y-COORDINATE : 26.1 Km

           Press Q to QUIT

This screen also appears after you have crashed. It will then have a message giving the reason of your unfortunate accident.
Whenever you take-off or refuel the flight time and total distance will be set to zero.
Fuelconsumption is an approximate average.

From the X and Y coordinates given, you can read your position on the WORLD map.
If you are in level 0 you can call up a report whenever you are in midair. This can be helpful if you are lost and are not yet familiar with finding your position with the help of the radio beacons.
Chapter 6 gives more information on radio location.

CHANGE MODE

The following screen appears:

> CHANGE MODE:
> 4 … MODE 4   (black&white)
> 8 … MODE 8   (colour)
>
> Q … QUIT (NO CHANGE)

Pressing '4' or '8' brings you in graphics mode 4 or 8 respectively and loads the cockpit screen from the data cartridge.
The difference between the two graphics modes is that in mode 8 you see the objects in solid colour, while in mode 4 they are drawn in black or white lines. Because drawing in solid colours is slower, the movements of objects in mode 8 will be less smooth than in mode 4.
Pressing 'Q' has no effect on the current setting

SOUND
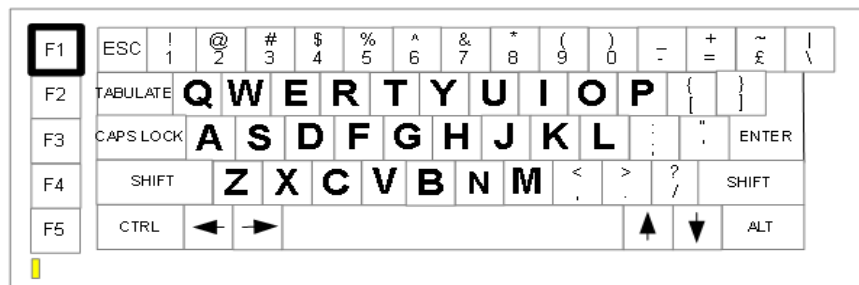
SOUND toggle on/off: Press F1

REFUEL
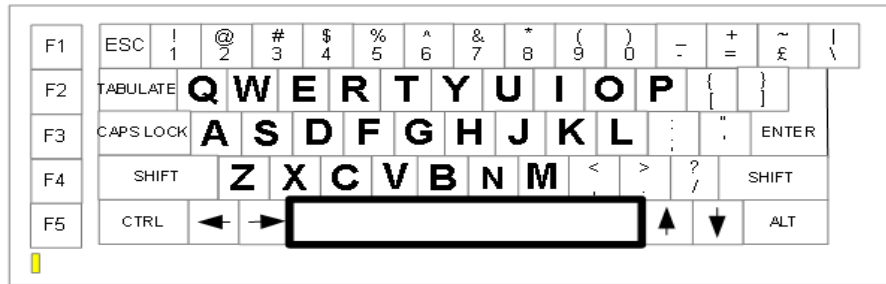
Refuel: Press FIREbutton or SPACEBAR

In order to refill your fuel tanks, the following conditions must be fullfilled:

1. You must be on the ground (altitude=0 m)
2. You must be near the center of the fuelmark
   (This is best done by TAXIing slowly towards the fuel mark, while your MAP is on. ZOOM in until you see the runway in sufficient detail to make accurate movements. When you are close to the mark, set the BRAKE on. If the plane does not come to a standstill near the center of the mark, release the brake and try again).
3. Speed must be zero (IAS-0 km/h).
4. Power must be off (Power=0%).

When all these conditions are met, press the FIREbutton or SPACEBAR and look at the fuelindicator. You will see (and hear) the tanks being filled.
Now give power, taxi to the start of the runway and OFF YOU GO!!

RESET
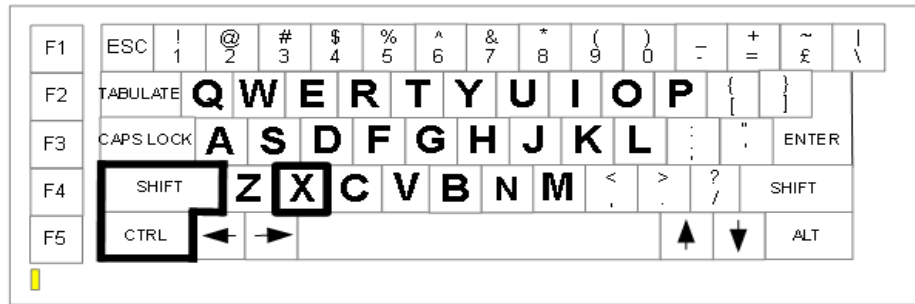
Reset: Press CTRL, SHIFT and X together

This brings you back to initial conditions. You will back at the start of the runway 1 if you are in level 0 or at the runway you choose last if you are in the level 1 or 2.
This key combination does not work in COMMAND mode.

PAUSE

Pause: Press P
Continue after pause: Press C

Press P until you hear a BEEP. The program halts until you press C to continue the simulation.
Note: The internal clock will <u>not</u> be paused. This means that after a PAUSE the figures for flight time and fuelconsumption are not correct anymore.

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5. **YOUR FIRST FLIGHT**

In this chapter we will help you to make a short flight, and a succesfull landing. We assume that you have just made a copy on microcartridge.
Reset the QL or turn it on.
Put the cartridge in MDV1 and press F1 or F2.
You will first see a Qliberator message and then the present time will be displayed. You can now give new values for hours and minutes. If you press 'ENTER' only, nothing will be changed.
After a short while the cockpit screen will be loaded and you see the copyright message.
At the end you will be presented with a view on runway no. 1.
See Figure 5.1.
NOW FASTEN YOUR SEATBELTS, PUT ON YOUR HELMET... HERE WE GO!!!!
If you follow the instructions carefully, you will make a succesfull landing on runway 2 in ten minutes from now.

1. Give POWER until the meter reaches full scale i.e. 100%.
2. Release the BRAKE. You will start moving on the runway.
   Watch you speed indicator.
3. If the speed (IAS) reaches 100 km/h (60mph), give an ELEVATION of +2 degrees (the elevation indicator will move two steps downwards)
4. Now wait until the ALTITUDE is 100 meters. Then bring the power back to exactly 50%.
5. You will have seen the radio telescope in front of you. Set the MAP on. You will see as a small black dash. When it comes close to the cross below the middle of the screen (it indicates your position), ZOOM in. By the time the telescope passes you underneath, your ALTITUDE is approximately 200 meters. Now set the view back to normal (MAP off).
6. Before you is a little white 'blob'. This is actually a sign with the letters 'QL' on it. On another occasion, when you master flying, you can try to fly over it at a low altitude say 50 meters. For now just let it pass under you.
7. If you ALTITUDE reaches 250 meters, you will see the Runway appear. As soon as this happens, set you ELEVATION to neutral (The indicator must be at mid position) and lower the FLAPS. This will reduce your speed and bring you in a continuous descend.
8. If all is well you will land automatically. When the wheels touch the ground (you will hear the sound of it), set the BRAKE on. After a short while you will come to a stand still.

9. If you where not so succesfull and landed in front of or beyond the runway, you will crash. Try the whole exercise again and if you reach item 7, follow the instruction at an earlier or later point in time.

The instruction we have just given, is not the only, nor the best way to fly and land. For example, normally you would retract your landing gear after take off. It is also not necessary to use your flaps in order to land properly.
You will have to find your own style of flying. We think it is the best to fly 'smooth'. What we mean is : do not use your controls to the limit when there is no need. In general however it is up to you to discover how the aeroplane reacts and behaves in certain circumstances. We think the information presented in this manual is sufficient to get a good start.
We will leave you alone now with the aeroplane; with the reassuring thought that a crash will not be not destructive nor lethal. For this and many other reasons we have come to love computers!

Fig 5.1 At the start of RUNWAY 1.

6. **ODDS & ENDS**

This chapter contains information on subjects that or not or not extensively treated in the foregoing chapters. The keywords are arranged in alphabetical order so that this chapter can also be used as a glossary.

BOOT PROGRAM.

Under normal circumstances you should never change the BOOT program on your copy. The few changes you can make in order to adapt the program to your own needs, are mentioned here.

Line 100 Dev$='MDV1_'.

This line defines the BOOT devices. If your copy can only be read by microdrive 2, then change this line accordingly and BOOT the program by hand : LRUN MDV2_BOOT.

Line 110 Dev2$='MDV2_'.

This line defines the device that contians the DATA files. You can change it if you have copied the data into another device e.g. a Floppy disc or a Hard disc. Use the proper abbreviations like 'FLP2_' or 'FLP1' etcetera.

Line 220 LBYTES Dev2$&'WORLD_DAT', PEEK_L(misc_base+4):pause 50.

If you want to start flying in another world (e.g. NIGHT1_DAT), then put the proper name between the quotes.

Line 240 POKE_W misc_base+2,0.

Change this line to: 240 POKE_W misc_base+2,-1, if you want to use two Cockpit screen, see below under COCKPIT SCREEN.

Line 300 LBYTES Dev2$&'COCKPIT_SCR8',131072.

You can change this line if you have a mode 4 Cockpit screen and if you would normally Boot in mode 4 by pressing F1.

COCKPIT SCREEN.

As you will have noticed, we use the same cockpit screen for both mode 4 and 8. In the program a provision has been made to use different screens for each mode. All you have to do is to change the BOOT program to get this to work.

Change line 240 from:
    240 POKE_W misc_base+2,0
to:
    240 POKE_W misc_base+2,-1
Now you need two screen on your DATA cartridge or disc. The names of these must be:
COCKPIT_SCR8 and COCKPIT_SCR4.
You can of course draw your own screen if you want. On the next scenery cartridge we will include
a special mode 4 screen in compacted form. In order to decompact it, follow the next procedure:
Take the ORIGINAL cartridge. We assume that you put it in MDV1. On it is a file that is called
CLONE_obj. Now type:
    b=RESPR(15000)
    LBYTES MDV!_CLONE_obj,b
(wait for the drive to stop)
    CALL b
    NEW
You now have a new SUPER BASIC command called EXPAND.
We suppose that you have a DATA cartridge in MDV2 and the cartridge with the compacted file in
MDV1. Next type:
    EXPAND "MDV!_COCKPIT_CMP":SBYTES MDV2_COCKPIT_SCR4,131072,32768
Be sure you type as a one line command and don't forget the quotes after EXPAND. After a few
minutes you will have a copy of the cockpit screen on the DATA cartridge.
You can also use this procedure with the ORIGINAL cartridge if the CLONE program failed to
produce a good screen.

COLOURS.
On the second page of this manual we claim to give you 52 colours onscreen. Because we are no
wizards, and the QL has a maximum of 8 real colours we had to resort to a little trick, called
stipples. Stipples are a mixture of pixels of two or more colours. This mixture then appears as a new
colour, as with mixing paint colours. The problem is that a stipple combination gives different
results whether viewed on a television set, a monochrome or a colour monitor. The colour of some
of the runways in WORLD1 is a nice grey when viewed on a TV but gives a rather harsh result on a
colour monitor (we mean one with RGB connection), and is faint when seen in monochrome (turn
down the colour on your TV set to see this). Another thing is that a TV set can give irritating
moving patterns at the coloured regions of the screen. This is especially noticeable when you 'fly' in
mode 4. Just turn off the colour in this case.

So in order to get best viewing conditions, you might have to make some adjustments to colour, brightness or contrast of the display system you are using. When choosing the colours for WORLD1 and NIGHT1 we assumed that most people would use a TV set. In the future, when we develop more sceneries, we will also use colourschemes especially fit for monitors, bot monochrome and colour.

CRASH
An aeroplane crash can occur under several circumstances. We will list here all possible messages you can get after a crash:
In order of decreasing severity:
1. AIRSPEED (IAS) WAS TOO HIGH   (Always fatal)
2. YOU CRASHED INTO AN OBJECT   (Always fatal)
3. AIRSPEED (IAS) WAS TOO LOW
4. DESCEND SPEED (VSI) TOO HIGH
5. YOU FORGOT TO LOWER THE GEAR
6. YOU LANDED OUTSIDE A RUNWAY
Messages 3,4,5 and 6 only occur after an attempted landing, that is after you heard the noise of the wheels touching the ground.
You Notice that there is no message for example in the case of empty fueltanks, because this can lead to one of the above-mentioned situations.

ERRORS.
If an error occurs within one of the programs, a Qliberator message window will appear. Amongst other things it will state which error occurred. There are two possibilities: if you see the words RETRY (Y/N)? you can get out of the error condition when you type 'Y'. In the other case you see the words DATA and STACK with some numbers.
Press a key and the program aborts, there is no recovery possible. This latter ERROR condition should never occur. If it does often then let us know. The first ERROR condition can occur in several cases e.g.: when you remove the DATA cartridge and you request the program to load a new WORLD or another Cockpit screen you get the message 'NOT FOUND'. Put the cartridge back again, press 'Y' and you're out of trouble.

Another message that can occur during BOOTing is 'OUT OF MEMORY'. It can happen on a 128k QL with programs, toolkits or a disc system that reserves some memory before you load the flightsimulator.

Programs or toolkits that fix the 'bug' in the MODE command, can cause an undesired effect when you switch between MODEs in the simulator. A solution to this is to reset the QL if you want to fly in another screen mode.

If a regular error or even a complete system shutdown occurs, first check your hardware and the existence of extra toolkits or programs that link in after a reset. Try to strip your QL to a 'bare' computer that does not contain more than perhaps some extra memory. If the problem persists, then write us and we will try to help you.

GRAPHICS.
The routine for the calculation and drawing of the three dimensional graphics are completely written in machine code. It included fast integer arithmetic, very fast line drawing and area filling routines, hidden polygon algorithm, colourtables etc. The result is that objects are drawn with sufficient speed to increase realism of the flight simulation.
About speed: we estimate that the same routine implemented in SUPERBASIC would give results upto 100 times slower then machine code!
The projection of objects upon the cockpit window suffers from some minor imperfections (we trade accuracy for speed!). This can mean that you occasionally find some off lines or coloured planes on your screen for a short while. You have to consider this as a normal situation (alas!).

LEVELS.
There are three levels of difficulty. Here we will summarize their differences:
LEVEL 0:
–   The turning rate is proportional to the amount of roll applied as shown in the roll indicator above the ATH. Maximum turning rate is +/- 3 degrees per second.
–   A report is always available. It is most usefull in finding your position on the map with X and Y coordinates.
–   Flaps do not influence the maximum speed.
–   There is no wind blowing.
–   You always start at runway no. 1 (after a crash or reset).
LEVEL 1:
–   The turning rate changes with the amount of roll applied. The rate in which this changes occurs in also depended on the IAS. The maximum turning rate is +/- 8 degrees per second.
–   A report is only available when you are on the ground. Orientation has to be achieved by looking for familiar objects or by means of radio location.
–   Maximum speed depends on whether the flaps are in or out:
Flaps in   : Maximum speed is 200 km/h.
Flaps out : Maximum speed is 180 km/h.
–   There is no wind in this level.
–   You can choose from which airfield you want to take off.
LEVEL 2:
–   The same as Level 1 with one exception:
–   The direction and velocity of the wind blowing is definded at random when you select this level in the SET LEVEL command.

MAPS.
USING COORDINATES. A map covers an area of 50x50 km which we call a world. It shows the positions of the radio beacons, the airfields (runways) and various objects. The exact position on the map can be determined from the value of two numbers. These numbers are called X-coordinate and Y-coordinate. The coordinates are given (in kilometers) when you use the REPORT command and from them you can determine the position of the aircraft on the map. We will give a few examples to illustrate the use of coordinates:
The upper left corner of a map/world is at coordinates X=0 and Y=0.
The lower right corner is at X=50, Y=50. The middle of runway 1 in WORLD1 is at X=25, Y=30 and the sixth radiobeacon is at X=45, Y=25.
CROSSING BORDERS. Normally, flying from one airfield to another is done within the boundaries of the map. This is not necessary however. In some cases take shortcuts by moving across a border. You will still be in the same world, but at another spot. When you cross a border, objects will suddenly disappear and others will come into sight. At the same time the direction of all the radiobeacons will change. This can be quiet confusing, and you could be disorientated for a while. To help in your orientation, imagine the map being surrounded by other maps like in the figure below.
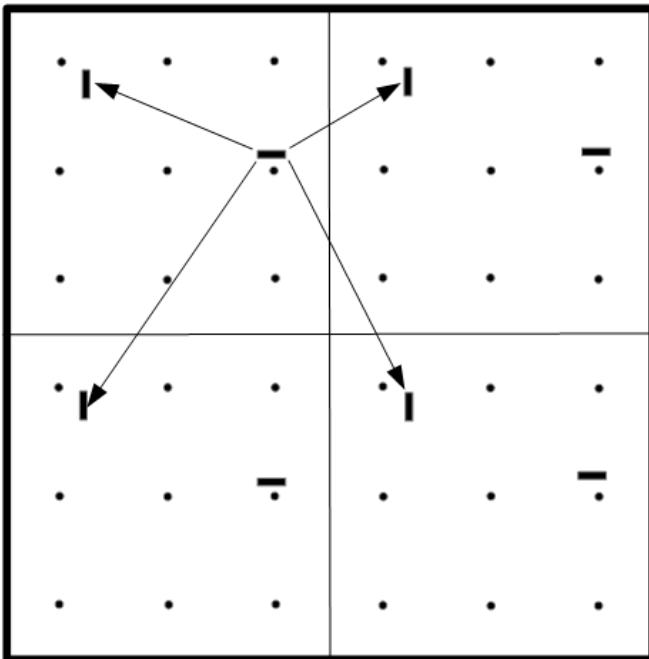
There are several routes to fly from one airfield to another. Crossing a border can sometimes mean shorter flight time, but can also be confusing at the same time.

ORIENTATION.

In order to know your whereabouts in the landscape, you can try to orientate on different (groups of) objects. This is very well possible when the following notes are taken into account.

When objects are far away they can be not easily be recognised. Especially in mode 8 they often look as undefined coloured blobs. This due to the poor resolution of mode 8 and there is little to be done about it except for flying in mode 4. This mode has another peculiarity resulting from the fact that only the outlines of objects are drawn. Therefore objects seem to be transparent and you are able to look through them (but not fly through them, as you can easily prove to yourself!). It apples to both modes when we say that you have to get accustomed to their optical appearance.

Another point we want to make is about the distance of objects. In the real world, when you stand on the ground in a flat landscape you can see objects up to 12 km (7.5 miles) away. Beyond that distance they disappear behind the horizon. When you go higher e.g. climb a mountain or take off in a plane you would be able to see further away. In our simulation however the radius wherein objects can still be seen is fixed at 5 kilometers (3 miles). If am object come within this range it suddenly 'pops up' into the cockpit window. Another implication bring about, that if you are flying at an altitude of say 1 kilometer you will not be able to spot objects on the ground. They do show on the map however, so you will no be without their 'guidance' entirely.

RADIO LOCATION.

There are nine radio beacon numbered 0 to 8, with beacon 0 at the middle of the map (at coordinates X=25, Y=25).You can use the beacons mainly for two purposes. One is to find your position on the map, if there are no recognisable objects around. The other is to quickly find the aproximate direction in which to fly, when you want to go to a certain part of the 'world'.
When you want to know your whereabouts, first find out the direction of beacon 0, taking into consideration your direction of flight. Then find the direction of one or two other beacons. Make up your approximate position from this information.
If you want to fly to a certain part of the map then find the radio beacon that is closest to that area or in the same direction.
Find the direction of this beacon and make a turn until it is in front of you (at zero degrees). During the turn you can press the key that corresponds with the beacon continuously.

TAXING.

The art do driving around the runway in order to reach a certain position e.g. the refual mark. If you are standing still, then increase your power to about 20% and release the brake. If your speed is constant, you can adjust it by giving more or less power. A power of less than 10% will actually serve as a brake. You can change your direction by using the YOKE's roll mechanism. TAXIing outside the runway is allowed, it's even possible to drive from one runway to another. Be carefull not to hit any objects or a CRASH will result.

WORLDS.

Each world has a fixed dimensions of 50x50 km. They can hold up to five runways. Worlds not only differ in the number of runways they contain, but also in the number of objects, their appearance and their position. Also the colours of ground and sky can be different. When flying you will notice that large parts of the landscape are rather empty. This is due to the fact that all information about objects (form, colours and position) has to be fitted in 12k bytes. In the future we will develop worlds that are more crowded and thus consume more memory. A condition is that in order to use them, you need a memory expansion of 64k or more attached to the QL.

APPENDIX 1 <u>DATA AND CONVERSION TABLES</u>

Some data of the simulated (imaginary) aircraft:

MAXIMUM SPEED (flaps in)	200 km/h
MAXIMUM SPEED (flaps out, level 1&2)	180 km/h
STALL SPEED	72km/h
STALL RECOVERY SPEED	90 km/h
MAXIMUM VSI AT LANDING	-3 m/s
MAXIMUM HEIGHT (THEORETICAL)	10000 m
MAXIMUM HEIGHT (IN PRACTICE)	-4500 m
MAX. RANGE (WITH FULL TANK)	60-75 km
MAX. FLIGHTTIME (FULL TANK)	30-50 min

Conversion rates:

1000 meter = 3281 feet	1000 feet = 305 meter
1000 meter = 0.621 mile	1000 mile = 1609 meter
10 meter per second (m/s) = 36 kilometer per hour (km/h)	
10 km/h = 6.2 mile per hour (mph)	10 mph = 16.1 km/h
1 Liter = 0.26 gallon	1 gallon = 3.79 liter

Table for conversion of meter into feet (approx.):

meters:	feet:
0	0
10	33
20	66
30	98
40	131
50	164
60	197
70	230
80	262
90	295
100	328
1000	3281