Flytec 6040 GPS

Firmware Vers.2.07b
Revision: 08.07.2014

Warning! Read before you proceed! Warning!

This instrument is not a safety device and should not be used as an indicator of safe flying parameters. This instrument should only be used for information purposes. Aviation can be a hazardous and possibly fatal activity. As a pilot, you are entirely responsible for your own safety and the safety of others around you. Pilots should abide by applicable aviation authority regulations and use best judgment for safe flying at all times, irrespective of instrument readings. Flytec is not responsible for loss or injury caused by the use of this instrument. You assume all risks associated with flying and the use of this instrument. Individuals who ignore this warning do so at their own risk and may suffer serious personal injury, property damage, or death.

If you are unwilling to assume all of the risks associated with the use of this instrument, do not use the instrument. Return it immediately, unused with all of its included items, within 30 days of the date of purchase, for a full refund. Please note that instruments showing signs of use or those that have been damaged or modified in any way cannot be accepted for return.

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On/Off Key

Lanyard

1.2 Switching the Instrument On/Off

```
Init EEPROM

English          ↑
Deutsch
Francais
Espagñol
Italiano
_____  ↓

       (OK)
```

To switch the 6040 **on**, short-press the *On/Off* key for one second. The instrument will beep once, and the display will show a list of possible languages. Select the desired language with the ▲ ▼ keys and press the *OK* key to continue. The selected language will now be in effect automatically, and in the future you will only need to press the *OK* key to confirm start-up. If the 6040 powers down without advancing to the next screen, it is most likely an indication that the batteries are critically low. In this case the 6040 should be charged or temporarily replaced with alkaline cells before proceeding. **Please see Section 0.** Repeatedly attempting to power-up the instrument with weak batteries can cause unit malfunction.

```
       FLYTEC AG
         6 0 4 0

    Sn    6777
TT34 Serial number:  6897

Owner:
       not set
Balloon registration
       not set

Version 2.05b   08.04.09
Date          Time (UTC)
31.04.09          20:13
Battery check for 3 s. .
Battery Bank 1: 88%
Battery Bank 1: 88%
```
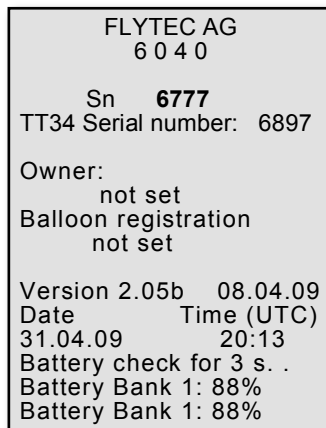
After you press the *OK* key, the display will show the Start-Up screen for 15 seconds with the following information:

- Type of instrument and serial number
- TT34 serial number (if set)
- Instrument owner and balloon type (if set)
- Firmware version and date
- Time and date
- Battery status for Banks 1 and 2

When the battery test is complete the 6040 will enter run-mode.

```
----------------------------------------
       FLIGHT -ANALYSIS
----------------------------------------
Date:   17.20.07  UTC
Start:  13:02:02  UTC
Stop:   15:55:32  UTC
Flight time:     2:53:30
Scanrate:   10 s

Max A1:  2823 ft
Max A2:  1154 ft
    A3:  4273 ft

Max Env temp:       140 F
Max Vario (10s):   420 fpm
Min  Vario (10s):  -270 fpm
Max speed:  12 mph
Show                  Recal
Map                   Sign.
```
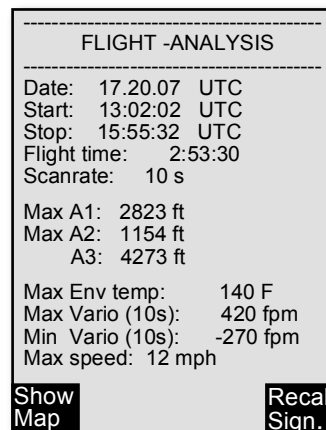
To switch the 6040 **off**, press and hold the *On/Off* key for 3 seconds. To prevent unintentional switch-off, the display will show *"really switch off?? Press OK to confirm."* Confirm by pressing the *OK* key. If the instrument has not registered a flight, the display will show the Shutdown screen. The remaining battery status will be shown, as well as the comment *"Wait 10 seconds before next power on."* **Important: failure to observe this instruction can cause malfunction.**

Alternatively, if a flight recording has occurred, the display will show the **Flight Analysis Page** where the particulars of the recorded flight are shown. A short press of the *OK* key or the *On/Off* key will complete the shutdown process.

If the 6040 does not recognize the commencement of a flight for 30 minutes since switch-on the unit will automatically power down.

1.3 Keypad

White lettering on the keypad indicates actions/functions executed with a short-press of that key. Yellow lettering indicates actions/functions executed with a long press (3 seconds) of the key and are associated with making a selection or adjusting a setting.
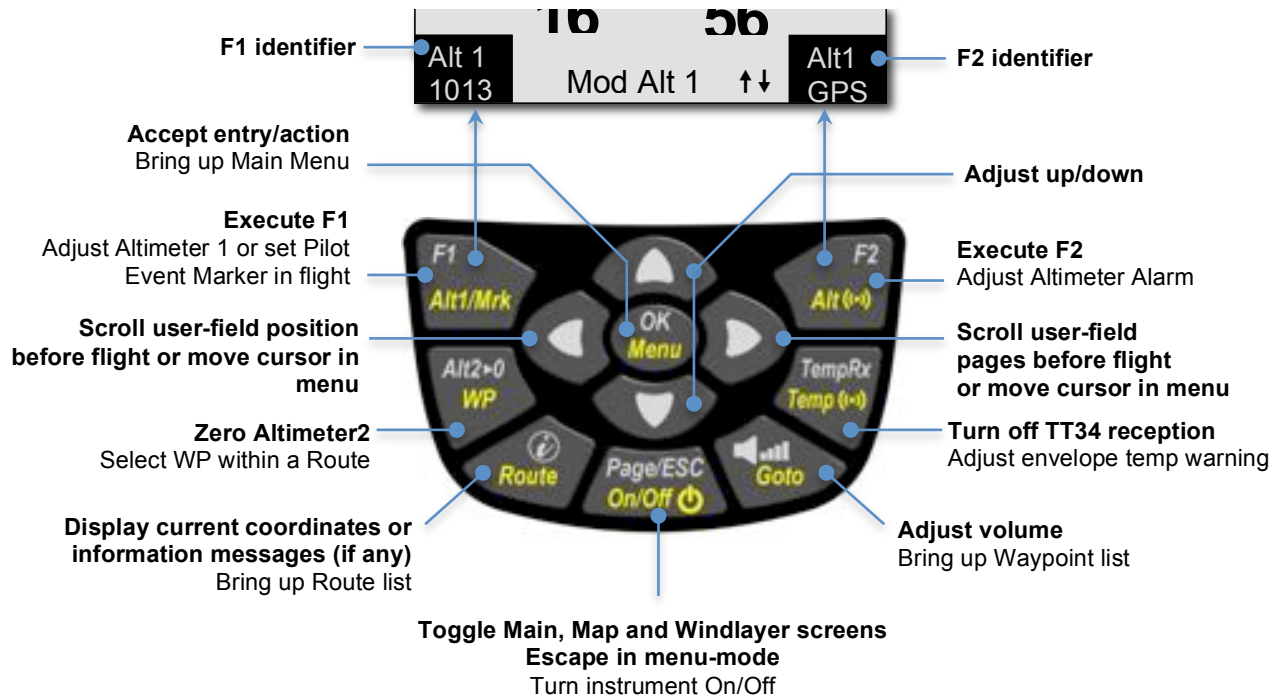
1.3.1 Function Keys F1 and F2

The 6040 has two **function keys** (*F1* and *F2)*. Their functions are context-dependent, with their current meanings shown in the black boxes in the lower left and lower right corners of the display. For example, on the Map screen the *F1* and *F2* keys are related to the Zoom In and Zoom Out functions, whereas in Set Altimeter mode the *F1* key is used to set the altitude referenced to 1013mb, while *F2* sets the altitude based on the internal GPS.

1.3.2 Entering Text

While it is considerably easier to enter alphanumeric data such as pilot name, balloon type or waypoint name using FlyChart (**as discussed in section 6.2**), this can also be accomplished with the 6040 keypad even though it does not have letter/number keys. To serve as an example, the following is the process for entering the pilot's name into the 6040:

Long-press the *Menu* key, scroll down to *Settings* with the ▼ key and press *OK*, then scroll down to *Pilot name* with the ▼ key and press *OK*. Note that there is a blinking cursor in the Pilot Name field ("*not set*" is there as a place holder). Use the ▲ and ▼ keys to scroll through the available upper case letters and symbols, or short-press the *F1* key to cause the ▲ and ▼ keys to scroll through lower case letters and numbers. Press *OK* to accept the selection and advance to the next character. Continue this process through all the characters of your name. The cursor can be moved with the ◄ and ► keys, and characters can be deleted with a short press of the *F2* key.

1.4 Display

The 6040 has three different flight display pages: **Main**, **Map** and **Windlayer**. When the 6040 is switched on, after the start-up sequence, it defaults to the Main page. The other pages can be sequentially stepped through using short presses of the *Page/Esc* key.

Main page	Map page	Windlayer page
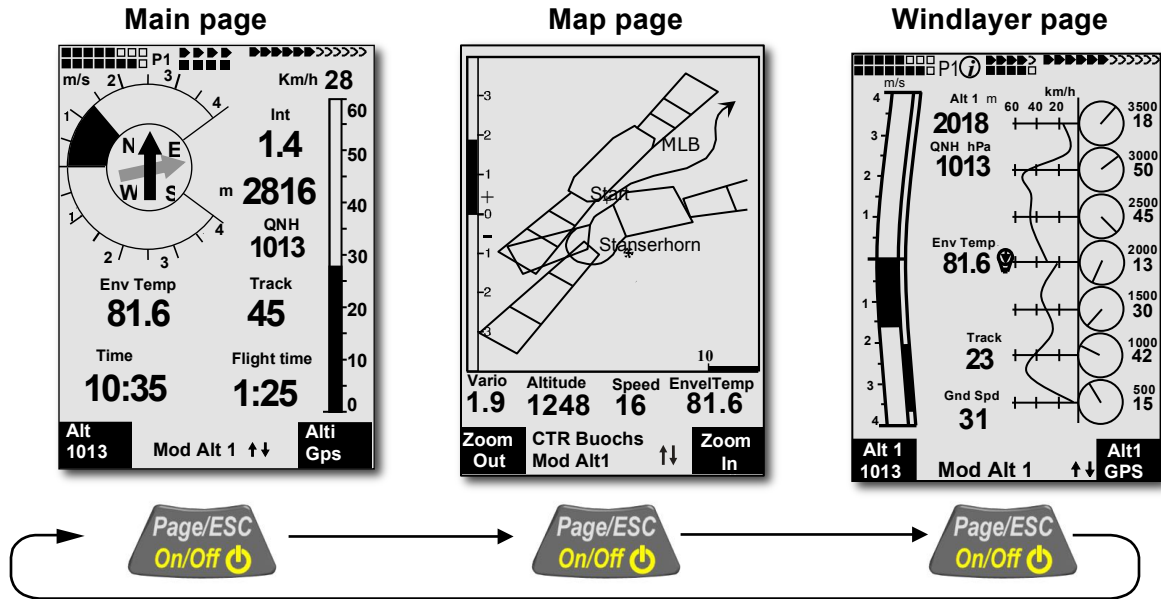
Short-press the *Page* key to scroll among the three display screens.

1.4.1 Main Page

The Main page (shown below) features a combined vario dial and compass in the upper left region of the display, analog and digital ground speed along the right side, various status indicators across the very top, and a group of user-fields where specialized flight information is shown.
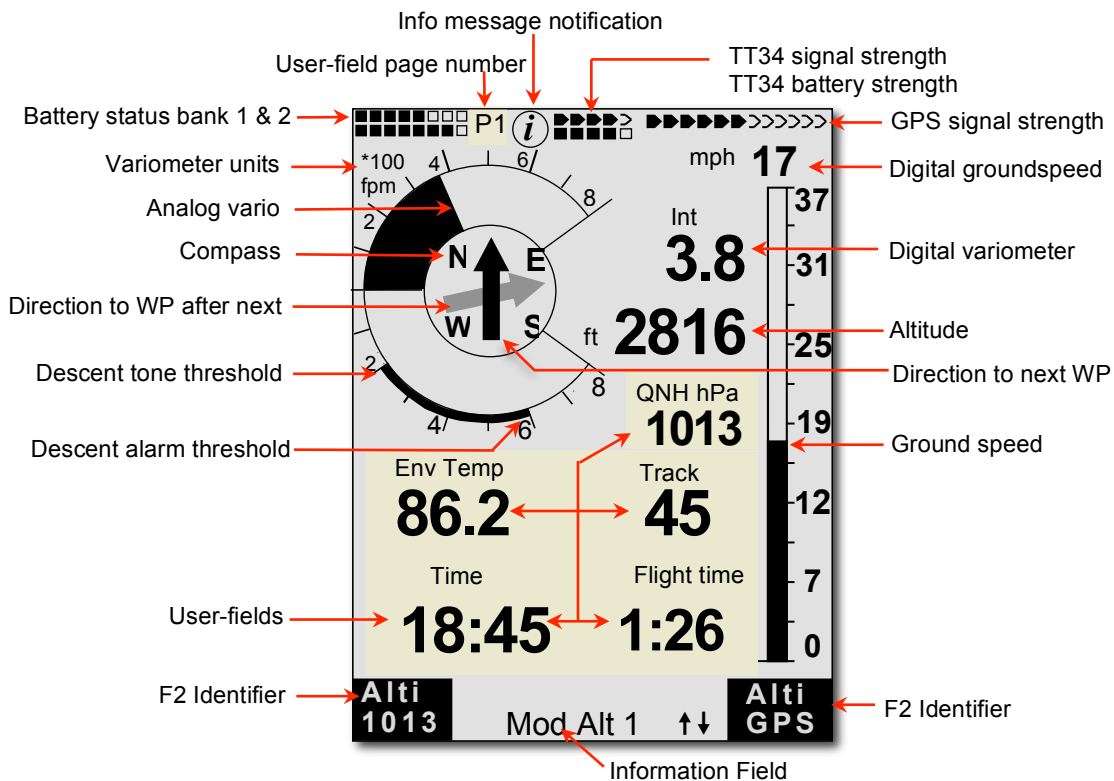
The data shown in the user-fields can be selected by the user. The Main page can be set to display either 5 or 7 user-fields, and there are three sub-pages of user-fields that can be scrolled with a short press of the ▶ key. The sub-page number (*P1*, *P2* or *P3*) is shown next to the battery status. For a listing of possible user-fields and instructions on how to assign them, **please refer to section 1.5**. When the option for 5 user-fields per page is selected, the values will be displayed considerably larger than at 7 per page.
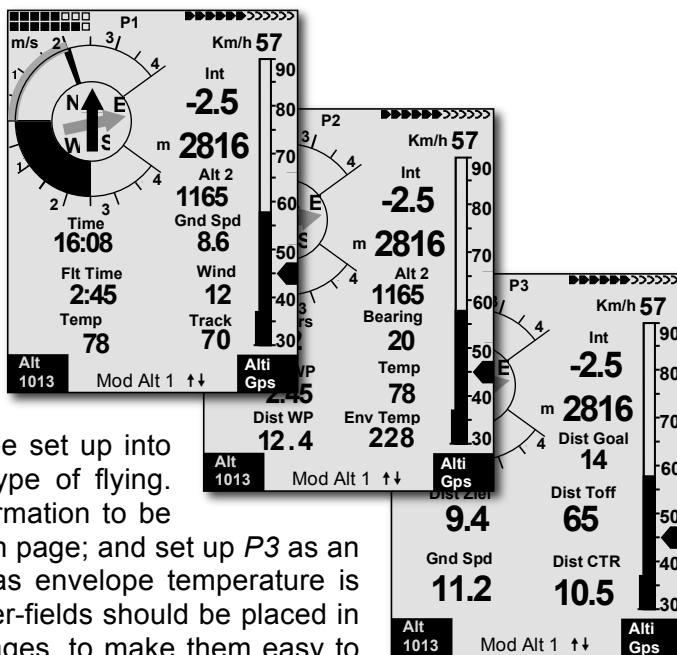
It is recommended that the three sub-pages be set up into groupings of user-fields that best suit your type of flying. For example, set up *P1* for general flight information to be used for normal flight; set up *P2* as a navigation page; and set up *P3* as an altitude alert page. Certain information such as envelope temperature is important at all times during a flight. Those user-fields should be placed in the same relative positions on all three sub-pages, to make them easy to locate regardless of which sub-page is displayed.

1.4.2   Map Page

A short press of the *Page/ESC* key will bring up the real-time Map page where your track, your waypoints, the active route, and any restricted airspace you have defined will be visible. If a Competition Route is active, start/turnpoint/goal cylinders and course line will be shown as well. Digital vario, altitude, ground speed and envelope temperature (if TT34 is in use) are shown just below the map, and an analog vario scale is shown along the left edge of the map. Your current position will appear on the track as a direction arrow (north is always up). The map can be zoomed in and out with the *F1* and *F2* keys; the map scale is appears in the lower right corner.

Airspace boundary

Analogue variometer display

Altimeter

Digital variometer

Function of F1 key

Waypoint

Track

Groundspeed

Scale

Envelope temp

Function of F2 key

Information Field
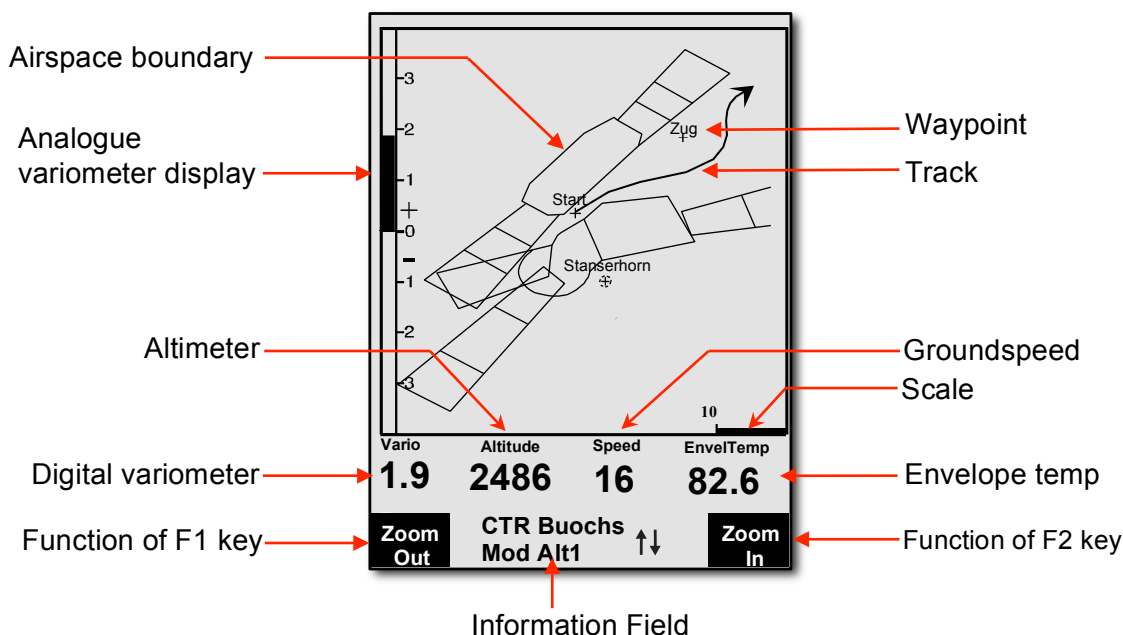
Key	Action on Map Page
F1 Zoom out	The map scale is incrementally increased until the complete track is shown.
F2 Zoom in	The map scale is incrementally decreased to show greater detail.
OK	Jumps back to complete flight view.
ⓘ	Calls up information related to the three closest airspace avoidances.
Page	Advances to the next display page.
►	Hides all waypoints not used in the active route (during flight). If the map is redrawn (e.g., zoom in/out) all waypoints within the scale of the map are shown.
All other keys cause the displayed track to be redrawn	

When viewing a stored flight, the ◄ ▲ ▼ ▶ keys can be used to pan the map in each respective direction. However, this function is not enabled during flight.

Note: Tracks are drawn backwards from the current position. It will take a few moments to draw the map/track, depending on the number of track points in the flight track (*"Wait"* and *"Ready"* will correspondingly appear in the Information Field). If a zoom or pan key is pressed while the map is being drawn, the original draw will be suspended and will start over again with new pan/zoom selection. This allows you to quickly view the desired section of the map.

1.4.3   Windlayer Page

A short press of the *Page/ESC* key will bring up the Windlayer page. The right side of this page features an innovative graph that displays the wind speed and direction at various altitudes based on the data collected during flight. The graph can be zoomed and panned to get greater detail. The left side of this page has an analog vario scale. Between the vario scale and the wind layer graph are 5 user-fields.

As you fly through different altitudes, the 6040 stores the wind speed and direction observed by the internal GPS and will display this information plotted against a vertical altitude scale. The scale will automatically adjust based on your altitude above the take-off elevation; however, the scale can be zoomed and scrolled with the *F1* and *F2* keys. To zoom in or out, press the *F1* key and move in or out with the ▲ ▼ keys. To scroll the scale up or down, press the *F2* key and move up or down with the ▲ ▼ keys.
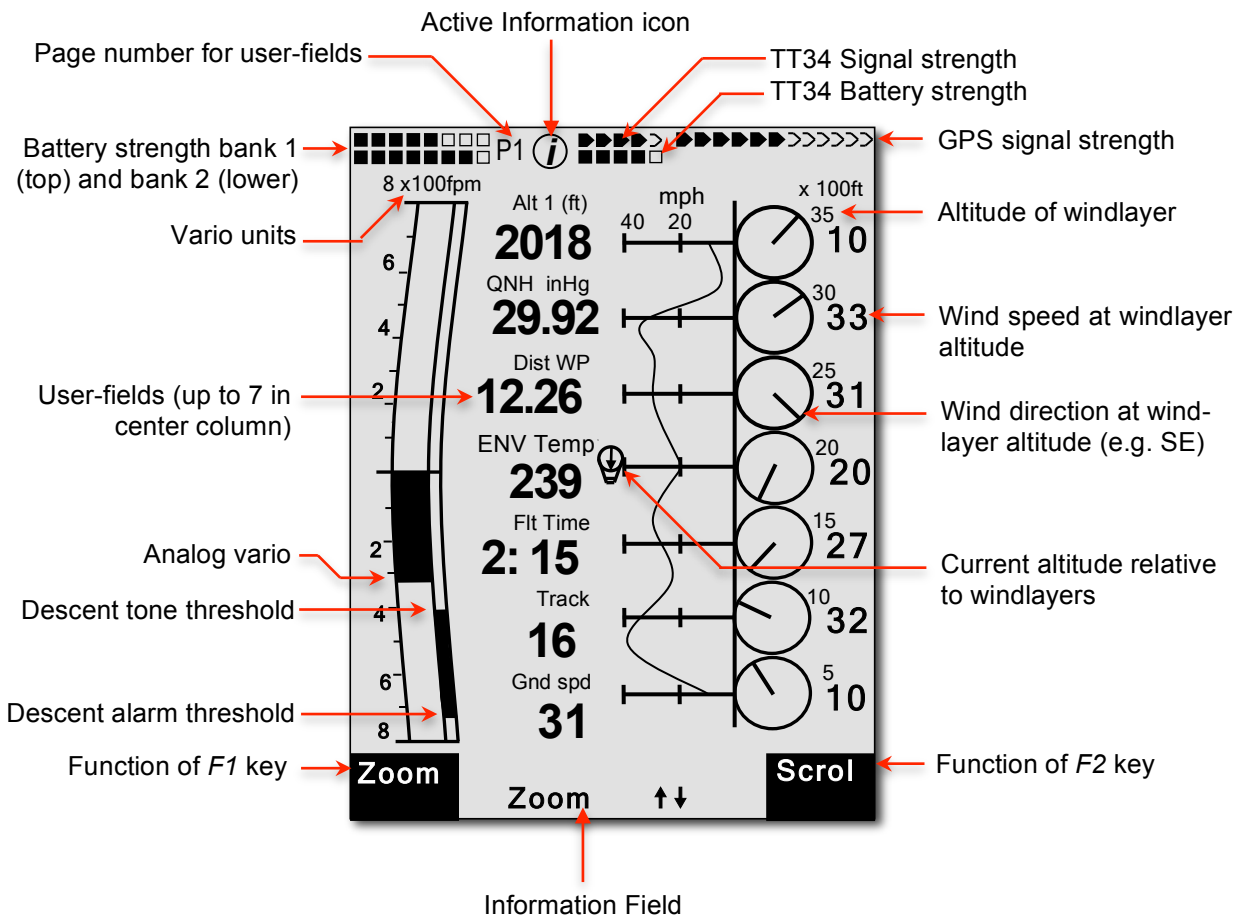
The Windlayer page has three sub-pages of user-fields that can be scrolled with a short press of the ▶ key; the sub-page number (*P1*, *P2* or *P3*) is shown next to the battery status. For a listing of possible user-fields and instructions on how to assign them **please refer to section 1.5**. When the option to display 5 user-fields per page is selected, the values will appear considerably larger than at 7 per page.

1.5 User-fields

The Main and Windlayer pages each have 3 sub-pages of user-fields that can be scrolled through using a short press of the ▶ key. The sub-page number (*P1*, *P2* or *P3*) is shown next to the battery status. To assign a user-field, press the ◀ key to scroll to the desired user-field position. The name of the corresponding user-field will be highlighted in black above the selected field and will appear in the Information Field. To change the user-field shown in the selected position, use the ▲ ▼ keys to scroll through the list of possible values (shown below). If the user-field is not changed within 10 seconds, the highlighting will cancel and the original user-field will remain. During flight you may page among the three sub-pages using a short press of the ▶ key; however assignment of the user-fields will be blocked. The selection of 5 or 7 user-fields for each of the three user pages is set in *Menu>Instrument Setup>Userfields*. Set each page to *Yes* for 7 user-fields per page or *No* for 5 user-fields per page. When the option for 5 user-fields per page is selected, the values will appear considerably larger than at 7 per page.

User-field name	Description	Page reference
[blank]	User-field remains empty	n/a
Time	Time of day	25
Flt Time	Flight time since take-off	30
Vario	Digital variometer	24
Alt 1	Absolute altitude (in feet or meters as set in Instrument Setup)	21
Alt 1 (ft)	Absolute altitude in feet	21
Alt 2	User-set reference altitude. May be quick-set to 0	22
Alt GPS	GPS altitude*	22
Total Alt	Cumulative gain in height during the flight	22
FL (ft)	Flight level in feet - not alterable	22
QNH hPa	Air pressure in hectoPascals	20
QNH inHg	Air pressure in inches of mercury	20
Gnd Spd	Ground speed*	25
Wind Spd	Vane wheel sensor air speed (requires optional sensor)	24
Track	Flight direction (course)*	29
Bearing	Direction to selected Waypoint*	29
XT Error	Perpendicular distance to the active leg of a route*	29
Dist WP	Distance to selected waypoint*	33
Dist goal	Distance to end of route*	33
Dist Toff	Distance from take-off position*	30
Dist Cyl	Distance to waypoint cylinder*	35
Dist CTR	Distance to next airspace restriction (loaded by user)*	**Error! Bookmark not defined.**
Upper Alt	Upper altitude alert	22
Lower Alt	Lower altitude alert	22
MaxEnvTemp	Balloon manufacturer never-exceed temperature	26
Amb Temp	Ambient temperature (inside instrument)	25
SMS p/t	Number of pending/transmitted SMS (optional feature)	n/a

| Env Temp | Envelope temperature from optional TT34 | 25 |

* Only available once the GPS has fixed its position

1.6 Main Menu

To access the 6040 Main Menu, long press the *Menu* key. To select one of the sub-menus, highlight the desired item with the ▲ ▼ keys and press the *OK* key. If a menu or sub-menu has more than one page, you can scroll through them with the ◀ ▶ keys. If a menu item has further sub-menus, heading is preceded with >

Menu Structure	Reference Section
Flight Memory and Tracks	1.6.1
Waypoints	1.6.2
Routes	1.6.3
Airspaces	1.6.4
>**Settings**	
>Variometer	
Vario response delay	2.3.1
Customize sound	
Sink tone threshold	2.3.3
>Speed	
Speed scale range	2.4.2
Vane wheel correction	2.4.1
>Recording	
Recording mode	4.1
Recording interval	4.1
Temp Alarm	2.7.1
Altitude Acoustic Alarm	2.2.5
CTR Alarm	
Pilot's name	1.3.2
Balloon model	1.3.2
Balloon registration	1.3.2
>**Clear/initialize memory**	
Delete all flights	1.6.6
Delete WP & routes	1.6.6
Format memory	1.6.6
Init CTRs	1.6.6
Simulation	1.6.7
>**Instrument Setup**	
Display contrast	
TT34 Serial number	2.8.1
Battery type	0
UTC offset	2.5
Units	3.5
Coordinates format	1.6.8
Pressure sensor offset	
User-fields	1.5
Language	
Bluetooth	Option
SMS	Option
>Optional Software	1.6.8.1
>Factory settings	
>**SD-Card**	
Generate IGC file	1.6.9
Export WP & routes	1.6.9
Import WP & routes	1.6.9

1.6.1   Flight Memory and Tracks

This menu contains all the flight recordings stored in the 6040. To view the list, highlight *Flight Memory and Tracks* using the ▲ ▼ keys and press the *OK* key. The records are stored according to the date of each flight, shown in the left column with the most recent flight on top. The length of each flight is shown in the right column. On this page, individual flights can be deleted from the list by pressing *F2 (Del. Flight)*. To view a flight, use the ▼ ▲ keys to move through the list, and choose the desired flight with the *OK* key. The flight, with its benchmark figures, is then displayed on the Flight Analysis page. Press *F1 (Show Map)* to view the map of the flight or *F2 (Recal Sign.)* to recalculate the Digital Signature (if you are having trouble sending this flight to the OLC). **For more information see Section 4.3.1**

Important: Although the 6040 will store up to 100 flights, it is recommended that recorded flights be routinely downloaded to FlyChart and then the 6040 Flight Memory cleared in *Menu>Clear/Initialize memory>Delete all flights*. This procedure provides security to your recorded flights and allows the instrument to record new flights with "refreshed" memory.

1.6.2   Waypoints

This menu contains all the waypoints loaded into the 6040. To view the list, highlight *Waypoints* in the Main Menu using the ▲ ▼ keys and press *OK*. If there are more waypoints than can be displayed on one page, you can scroll through the pages with the ◄ ► keys. To select a waypoint, highlight the desired waypoint with the ▲ ▼ keys and then press *OK*. The waypoint can now be edited or deleted (**see Section 3.5.3**). Waypoints can be added from the keypad using this sub-menu, or more easily using FlyChart (**see section 6.3**).

1.6.3   Routes

This menu contains all the routes loaded into the 6040. To view the list, use the ▲ ▼ keys to highlight *Routes* in the Main Menu and press *OK*. If there are more routes than can be displayed on one page, you can scroll through the pages with the ◄ ► keys. To select a route, highlight the desired route with the ▲ ▼ keys and then press *OK*. The route can now be edited or deleted (**see Section 3.6.1**). Routes can be added from the keypad in this sub-menu, or more easily using FlyChart (**see section 6.3**).

1.6.4   Airspaces

This menu contains restricted areas (CTRs) that have been loaded into the 6040. It is possible to load up to 300 CTRs depending on the complexity of the CTRs. To view the CTR list, highlight *Airspaces* with the ▲ ▼ keys and press *OK*. To select a CTR, highlight it with the ▲ ▼ keys and then press *OK*. The CTR can now be edited or deleted; **see Section 5.2.2**. CTRs can be added from the keypad in this sub-menu, or more easily using FlyChart.

1.6.5   Settings

This menu contains a series of settings that permit the 6040 to be customized according to your preferences. To view the list of settings, highlight *Settings* in the Main Menu using the ▲ ▼ keys, and press *OK*. To change a setting, navigate to the desired setting with the ▲ ▼ keys and press *OK*; the parameters with their current setting(s) are displayed. To change a value, press *OK*. The value to be changed will blink and can be modified using the ▲ ▼ keys. Press the *OK* key to install the new value; a confirmation tone will sound and the cursor will advance to the next parameter in the sub-menu (if there is one). Pressing the *ESC* key recalls the previous setting. **Note: User settings may be more easily set using FlyChart.**

Setting	Description	Reference	Factory Default
>Variometer			
Vario response delay	Vario responsiveness - range 0 (slow) to 4 (fast)	2.3.1	2
Customize sound	Modulation (2-9) Frequency of sink tone (300-1400 Hz)		Mod = 5; 700 Hz
Sink tone threshold	Descent rate required to sound: alarm (20–800 ft/min), descent tone (20-800ft/min	2.3.3	760 ft/min 490 ft/min
>Speed			
Speed scale range	Analog speed scale range: upper = 0-37 mph or lower = 0-25 mph	2.4.2	Upper [yes]
Vane wheel correction	Vane wheel 70 to 150 %	2.4.1	100%
>Recording			
Recording mode	Automatic start/end of flight recording	4.1	Automatic [yes]
Recording interval	Interval between tracklog points (2–60 sec) also shows max record time	4.1	10 sec = 48 hrs
Temp Alarm	Envelope temperature alert: 104ºF up to manufacturer's max, acoustic alert (on/off)	2.7.1	248ºF, On
Altitude acoustic alarm	Off, Silent (one short beep), Loud (continuous tone)	2.2.5	Silent
CTR Alarm	Acoustic alarm for airspace: yes /no		No
Pilot name	Enter pilot name	1.3.2	Not set
Balloon type	Enter balloon make/model/type	1.3.2	Not set
Balloon ID	Enter N-number	1.3.2	Not set

1.6.6   Clear/ Initialize Memory

In this menu the 6040 memory can be cleared and re-formatted. To view the options, highlight *Clear/Initialize Memory* in the Main Menu using the ▲ ▼ keys, and press *OK*. The various clearing/reformatting options can be executed by highlighting the desired action with the ▲ ▼ keys, pressing *OK,* changing the *No* to *Yes* with the ▲ or ▼ key, and pressing *OK*. **Caution: When deleting WPs, routes or flights, the deletion process will take a few moments. Please do not press any keys until the process is complete.**

Manage Memory	Description	Reference	Procedure
Delete all flights	Deletes all flight recordings. Re-formats Flight Memory.		Change *no* to *Yes*, press *OK*. Information Field will show the progress; wait for all sectors to clear before pressing any keys.
Delete all WP & routes	Deletes all WP and routes. Re-formats WP/route memory.		
Format memory	Clears all user-memory (flights/WPs/routes/CTRs) and resets to factory defaults		
Init CTRs	Initializes restricted airspace memory. Deletes all loaded airspace definitions.		

1.6.7 Simulation Mode

Simulation mode is an excellent way to learn how to use the 6040. In Simulation mode, the 6040 operates normally but you can alter your altitude, ground speed, vertical speed (vario), head/tailwind component, and track via the keypad. The GPS receiver is turned off during the simulation (*"Simulation"* appears in lieu of the GPS status bar). A simulated flight is stored in the memory of the 6040, but the Digital Signature is not valid.

To enter Simulation mode, highlight *Simulation* in the Main Menu using the ▲ ▼ keys and press the *OK* key. Use the ▲ ▼ keys to change *No* to *Yes*, then press the *OK* key; the display will return to the normal run-mode and the simulation will start at the last known GPS position.

To make changes to your altitude, vertical speed, ground speed, track or the wind, short-press the *F1 (Next Func.)* key to scroll through the list of variables. The Information Field will show each variable and which of the arrow keys to use to alter it.

var ↑↓ Spd ▶ ◀	Change climb/sink rate and change ground speed
wind ↑↓ Trk ▶ ◀	Change wind speed and flight direction
Mod Alt1 ↑↓	Change MSL altimeter (Alt1)

If you initiate an ascent with the ▲ key, you will see the displayed altitude increase and also see the balloon icon on the Windlayer page rise. After climbing up you can change back to gliding flight (descending) using the ▼ key.

The *Goto* function can be called up to select a waypoint; the distance to the waypoint will appear. If the direction arrow in the middle of the compass points upward, the pilot is moving towards the waypoint and the distance will become smaller. In Simulation mode a Competition Route can be set. If you navigate into a turnpoint cylinder or if you enter/exit a start cylinder with a positive start time, you will hear the "waypoint achieved" sound and you will also see the automatic switch-over to the next waypoint. By pressing the *ESC* key you can switch to the map display and observe the approach to the waypoint cylinder.

1.6.8   Instrument Setup

Instrument Setup	Description	Reference	Factory Default
Display contrast	Contrast setting 0–100%		50%
TT34 serial number	Set TT34 s/n (if used)	2.8.1	0
Battery type	Alkaline or NiMH	0	Alkaline
UTC Offset	Offset from UTC ±13hours; add 0.5Hr	2.5	-2; no
Units	m or ft; m/s or ft/min; km/h or mph or kn; °C or ºF; km or miles		m; m/s; km/h; °C; km
Coordinate format	dd°mm.mmm; dd.ddddd; dd°mm'ss″; UTM; Swiss Grid	3.5	dd°mm.mmm
Sensor offset	Correct pressure sensor to correct QNH. Contact Flytec for assistance.	n/a	Factory set
User-fields	Set number of user-fields for each of 3 user pages	1.5	yes: yes: no
Language	Text language (English, German, French, Spanish, Italian)		English
Bluetooth	Not yet available	n/a	n/a
SMS	Not yet available	n/a	n/a
Optional SW packages	Enter feature package release codes	1.6.8.1	n/a
Factory settings	For technician use only.	n/a	n/a

1.6.8.1   Optional Software Packages

With the help of a release code obtainable from Flytec AG or Flytec USA, additional special functions can be activated.

To enter a release code:
- Select *Optional SW-Packages* from *Instrument Setup* in the Main Menu and press *OK.*
- Highlight the appropriate software package from the Optional Software Packages list.
- Press *OK* and the code 30000 will start blinking.
- Press the ▼ key; the cursor will jump to 30000.
- Use the ▲ ▼ keys to set the code obtained from Flytec and press *OK*
- The 6040 display will show *"Package released."*
- **Note:** If you enter an incorrect code, the instrument will be locked for a few minutes.

1.6.9   SD Card

It is recommended that the 6040 be used with an SD card installed since the instrument will keep a system log file on the SD card, which can be beneficial when troubleshooting. The following files can be stored on and read from an SD/SDHC card loaded into the 6040 SD card slot:
- Any number of flights (saved as secure IGC Files)
- Any number of waypoint and route files (file type .GPX only)
- An unlimited number of air spaces (file type .FAF only)
- Instrument configuration (file type .CFG only)

Important! The SD card must be formatted FAT or FAT16 (which can be accomplished on a PC) and all folders (directories/subdirectories) and file names must be 8 characters or less. To avoid data loss or other malfunction, SD cards should only be inserted/removed when the instrument is switched off or in the Main Menu. It is recommended that you periodically backup the contents of the SD card they are not infallible.

Saving Flights to SD card:
At the conclusion of the flight (after the Digital Signature is generated), the flight will be saved to the SD card as an IGC file with a file name according to the IGC file naming convention. After a moment, the saving of the IGC file to the SD card is confirmed in the lower portion of the display with the IGC file name. To manually save a flight recording from the 6040 flights list to the SD card go to *Menu>Flight memory & tracks*, press the *OK* key, select the desired flight from the list and press the *F1 (Copy to SD)* key. IGC files saved to the SD card can be read by a PC with a SD card reader.

Remote transfer of flight tracks
If you have a smart phone with a Micro-SD card slot, you can transfer your flight to a online competition or a competition scorekeeper directly from your mobile phone. Using a SD card adapter, insert your phone's micro SD card into the instrument, save the flight as described above, then insert the micro SD card back into the phone and transfer the flight via an online contest server or as an email attachment.

Save/Retrieve waypoints and routes on the SD card
Waypoints and routes that are saved in the 6040 memory can be saved to the SD card. Conversely, waypoints and routes lists can be saved to the SD card via a PC in GPS eXchange format (.gpx) and then imported into the 6040. The waypoint list in a 6040 can be saved to the SD card prior to loading a new list so that the original list can be reloaded at a later time. Additionally, waypoint lists can be easily shared between 6040 pilots using an SD card.

To save the 6040 waypoint/route list to the SD card go to *Menu>SD Card>Export WP & Routes*, press the *OK* key, change *No* to *Yes* and press the *OK* key. The contents of the waypoint and route list will be saved to a file 6040_1.GPX on the SD card. A subsequent export will have the file name 6040_2.GPX, and so on. With this feature you can save essentially limitless waypoint/route lists.

To load a waypoint/route list from the SD card into the 6040, go to *Menu>SD Card>Import WP & Routes*, press the *OK* key, select the desired file from the list and press the *OK* key. The contents of the file will be added to the waypoints and routes already contained in the respective lists. If your intent is to only have the waypoint/routes contained in the SD card file in the respective waypoint/route lists then these lists should be cleared prior to importing. This can be done in *Menu>Clear/Initialize memory>Delete all WP & routes*

Load Airspace file from SD Card

Airspace saved to the SD card with a PC (in .faf format) can be loaded into the 6040 Airspace menu. Any number of airspace files can be saved to the SD card, each containing any number of individual airspaces. The selection as to which file is used is made in Menu>Main Setup Menu>SD-Card>Select CTR file. Highlight the desired airspace with the ▲▼ keys and press OK. The display will confirm the file you chose as "selected" in the lower portion of the display. This selection can also be made during the flight. This is useful if you cross a border for example and the file needs to be changed.

```
Select CTR File
-------------------------------
USA.FAF
FLS.FAF
FLC.FAF


-------------------------------
 USA.FAF selected


-------------------------------
```

If the selected file is valid, the instrument examines all the air spaces and loads the closest 100 CTR's into the instrument memory. This can take up to 10 minutes depending on the size of the .faf file. The 6040 periodically checks the distances to the unloaded airspaces in the active .faf file on the SD card and if you have moved closer to any of these, the instrument updates the airspaces accordingly. Consequently, when the 6040 is in use, the instrument memory will always contain the 100 nearest airspaces.

For more information about loading airspace on the SD card, editing airspace files and using the airspace function please see section 5.2.

Save/restore instrument configuration

The current instrument configuration (user-settings) can be saved to and restored from the SD card. To save the instrument settings: Menu>Main Setup Menu>SD-Card>Save settings>change No to Yes>press OK. A file xxxx.cfg (where xxxx= serial number of 6040) will be created in a folder named CFG in the root of the SD card. To restore instrument settings: Menu>Main Setup Menu>SD-Card>restore settings.

This function is very useful if it becomes necessary to reinitialize the instrument. By saving the 6040 configuration to an SD card, you can easily restore the configuration, thereby avoiding the need to manually reestablish all your settings/preferences after reinitializing. Additionally, 6040 users can easily share configurations by saving their configuration onto an SD card and another 6040 user restoring the settings from the card. It should be noted that for obvious reasons, the following items are not restored to a 6040 with a different serial number: Pilot name, Glider type, Glider Id, LCD contrast and GPS module type, device serial number, firmware version, unlocked software packages, device manufacture Flytec or Brauniger), calibration data (absolute pressure, differential pressure, LCD voltages and temperature correction).

1.7 Using the 6040

Setting up the instrument   Page Reference

• Enter pilot's name, balloon model and balloon registration.	6
• Enter TT34 s/n (code) if used.	27
• Assign user-fields for the three user-pages.	11
• Set alarms and thresholds.	22,26
• Enter waypoints and set routes if desired.	32
• Enter airspace or avoidance areas if necessary.	44,49
• Set recording interval (if an interval other than 10-sec default is desired).	36
• Check battery status and charge if necessary.	56

Prior to take-off

• Switch on the instrument several minutes prior to take-off time to allow adequate time for the GPS to acquire properly (10 minutes recommended).	29
• Check battery status (replace batteries if necessary).	56
• Set *Alt1* to take-off site elevation. If field elevation is unknown, press *F1* to reference *Alt1* to 29.92 inHg or press *F2* to set *Alt1* based on GPS altitude.	21
• Verify reception of envelope temperature (if TT34 is used).	26

The flight

• No need to start the flight recorder – it will start automatically when an altitude change is detected.	36
• Monitor altitude, temperature, airspace limits.	7
• The most important key-presses during flight are:	
Page key for shifting between Main, Map and Windlayer pages	6
▲ key for shifting between 3-sub pages on Main and Windlayer pages	6
◀ key to switch on/off the audible alerts	6
• Completion of the flight is automatically detected upon landing. Flight recording can be terminated at anytime by a long press of the *ON/OFF* key.	36
• Do not forget to switch off the instrument before stowing.	5

Viewing recorded flights

To view a flight on the 6040 display:	
• Turn on the 6040.	5
• Select *Flight memory* in the Main Menu.	37
• Highlight the desired flight and press *OK*.	37
• Flight Analysis page is displayed for the selected flight.	37
• Pres *F1* to view flight tracklog.	38
To view a flight on a PC with FlyChart:	
• Switch on the instrument and connect it to the PC with the USB cable.	5
• Go to the Main Menu.	7
• Launch the FlyChart program on your PC.	48
• Click the Download button on the FlyChart task bar.	

2   Functions

2.1 Altimeter and Air Pressure

Barometric altimeters calculate altitude based on air pressure: air pressure decreases as altitude increases. The calculation for deriving altitude from air pressure is based on an international formula (Commision International de Navigation Aérienne) and assumes a standard atmosphere with idealized characteristics. The CINA standard atmosphere assumes that the pressure at sea level is 1013.25 hPa (millibars) at 15°C. A continuous decrease in temperature at the rate of 0.65° C per 100 meters of ascent is also assumed.

In practice it is not quite so simple to derive altitude from atmospheric pressure because other factors influence atmospheric pressure. On a stable day, temperature-induced differences of one millibar (mb) will result in an altitude difference of +/-33 feet (10 meters). Depending on the weather, air pressure at sea level (**QNH**) may vary from 950 mb to 1050 mb. During rapid weather changes – for example the passage of a cold front – air pressure can change by five millibars during a day. This could mean an altitude difference of over 130 feet. Consequently, prior to use, an altimeter must be set to a known reference altitude (e.g., airport, launch site, topo map, elevation marker, etc.). An alternate method for setting an altimeter is to enter the current QNH pressure reported by local aeronautical weather reports or reliable meteorological institutions.

What is QNH? General air traffic needs a common zero point, so that at a certain altitude all aircraft show the same altitude on their altimeters. This reference point is QNH. QNH is the actual pressure calculated back to sea level. It is calculated several times a day, and can be taken from the aviation weather forecast or requested from airfields. In practice, most pilots set the altimeter based on a known altitude before launching.

The 6040 provides five altitude and two QNH pressure displays:

Alt 1	Altitude above sea level (QNH).
Alt 2	Altitude with respect to a reference height. Can be set to zero at any time with a long press of the *Alt2▸0* key.
Alt total	Displays the cumulated altitude for one flight.
FL (ft)	Flight Level is based on an air pressure of 29.92 inHg (1013 hPa) at mean sea level and cannot be adjusted by the user.
Alt GPS	Altitude from the internal GPS module. May be useful in competition where there is a ceiling and the scorekeeper will be checking compliance with scoring programs that use GPS altitudes. In this case, the pilot should monitor Alt GPS to be sure a declared ceiling is not broken.
QNH hPa	Actual air pressure in hPa at sea level in relation to Alt 1.
QNH inHg	Actual air pressure in inHg at sea level in relation to Alt 1.

2.2 Absolute Altimeter (Alt 1)

The absolute altimeter (Alt 1) is permanently shown on the Main and Map pages and should be adjusted to display the actual height above sea level (QNH). The QNH is originally set at the factory to a sea level pressure of 29.92 inHg (1013.25 hPa). Since it is seldom the case that you are taking off from sea level and the air pressure is also 29.92 inHg, the correct reference altitude should be set before starting each flight. Alt 1 can be displayed in user-fields **Alt 1** and **Alt 1 (ft)**. With this feature it is possible to read the absolute altitude in feet even if the main display is set to display in meters, making it easier to communicate your altitude with air traffic controllers.

Setting Alt 1 based on reference altitude:
When you first switch on the 6040, the Information Field defaults to display *Mod Alt1 ↑↓* and the ▲ ▼ keys can be used to set the desired altitude. Short presses of the ▲ ▼ keys will yield incremental adjustments. However, if a key is held, the value will change rapidly. If the Information Field does not show *Mod Alt1 ↑↓* it can be called up at any time with a long press of the *ALT1* key.
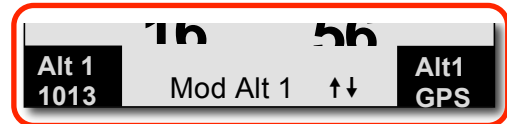
Setting Alt 1 based on reported QNH:
Since Alt 1 is based on the QNH pressure, if the *QNH* user-field is displayed, you will notice that when Alt 1 is being adjusted, so is the QNH value. This means if the elevation of your take-off location is not known but the QNH value is available, you can set Alt 1 by adjusting the QNH to the reported value using the ▲ ▼ keys.

Setting Alt 1 based on GPS altitude:
If the actual altitude of the launch place is not known and the QNH pressure is not available, the reference altitude for Alt 1 can be set based on the internal GPS with a short press of the *F2* key (*Alt1 GPS*). This F2 option is only available if *Mod Alt1 ↑↓* is shown in the Information Field (if it is not shown, long-press the *Alt 1* key to bring it up). Please consider that the GPS receiver only provides a reliable altitude value when it has a solid 3D fix. In the case of poor satellite constellation or bad reception, considerable altitude error is possible.

Setting Alt 1 based on 29.92inHg/1013hPa:
If the 6040 is not already in Alt 1 setting mode (*Mod Alt1 ↑↓* is shown in the Information Field) it can be called up with a long-press of the *Alt 1* key. Set Alt 1 referenced to 29.92 inHg/1013 hPa using a short press of the *F1* key (*Alt 1 1013*).

2.2.1 Relative Altitude (Alt 2)

The user-field *Alt 2* is a relative altimeter that shows the altitude above or below the point where it was last zeroed. Typically this altimeter will be zeroed at the take-off point so that the pilot can quickly see his/her altitude relative to the start of the flight.
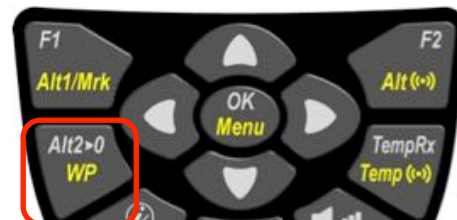
Setting Alt 2:
Short-press the *Alt2 ►0* key and the altitude will be set to 0. This can be done at any time during the flight and can be done as often as a new reference point is needed.

2.2.2 Cumulative Altitude (Alt total)

The user-field *Alt total* keeps a running total of the entire ascent during a flight. The cumulative altitude is also shown on the Flight Analysis page at the conclusion of a flight, and for previous flights in the Flight Memory.

2.2.3 Flight Level Altimeter - FL (ft)

The user-field *FL (ft)* displays altitude relative to Flight Level (QNH value of 29.92 inHg/1013 hPa). The display is in feet and is not adjustable. This readout is particularly important to pilots who are assigned a Flight Level by air traffic-controllers during flights in Restricted Areas.

2.2.4 GPS Altitude (Alt GPS)

The user-field *Alt GPS* displays the altitude derived from the internal GPS. This user-field is particularly important in competitions where a ceiling has been imposed and scorers will be using GPS altitude to verify compliance. Please consider that a GPS receiver only provides a reliable altitude value when it has a solid 3D fix. In the case of poor satellite constellation or bad reception, considerable altitude error is possible.

2.2.5 Altitude Alert/Alarm

The 6040 has an Altitude Alert function to help the pilot avoid predetermined altitudes. Floor and ceiling limits can be set, as well as flight corridors. If the pilot flies over a ceiling or below a floor or leaves a corridor, *Alt1* display switches to an inverse display (white number on a black background to draw attention to the exceeded limit) and a discreet alert tone is given. The ceiling is shown in the user-field *Upper Alt* and the floor is shown in *Lower Alt*.

Setting Altitude Alert limits:
Long-press the *Alt ((•))* key to bring up the Altitude Alarm setting mode (the Information Field and function keys will appear as shown). To set the ceiling, short-press the *F1* key and adjust the value with the ▲ ▼ keys. To set the floor, short-press the *F2* key and adjust the value with the ▲ ▼ keys. To disable an altitude alarm, set the limit to 0. If the alarm sounds, it can be silenced with a short press of the *OK* key. When the 6040 is in the Map or Windlayer page, a short press of the ① key will bring up the status of any active alarms.
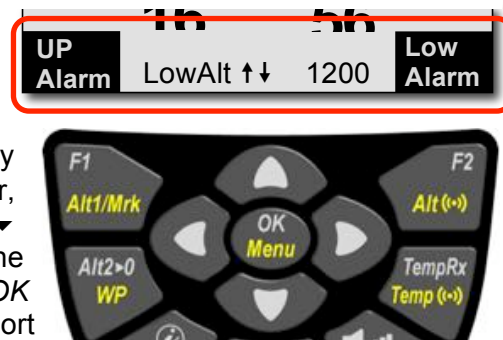
The altitude limits can be set in two ways:
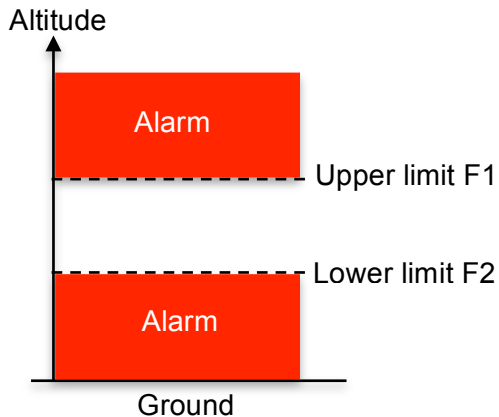
If the balloon goes above or below the set limits, a discrete alarm will sound.
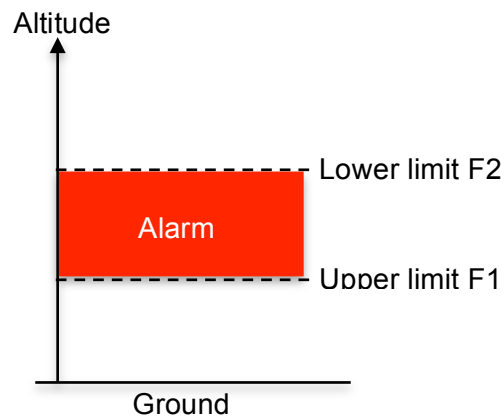
If the balloon is within the set limits a discrete alarm will sound.

2.3 Variometer

2.3.1 Graphic Vario Display

The 6040 displays **vertical speed** digitally and graphically in ft/min or m/s and indicates whether the pilot is ascending or descending and at what rate. The first scale range on the analog variometer display is +/-800 ft/min (Figure 1). If the vertical speed exceeds these limits, the scale automatically switches to a second range from 800 to 1600 ft/min (Figure 2).

Fig. 1 Vario = 300 ft/min

The response characteristics of the graphic vario and descent acoustics of the instrument can be filtered according to the pilot's preference. This filtering is set in *Menu>Settings>Variometer>Vario response delay*. The setting range is 0 (dampened and subdued) to 4 (fast and reactive). A setting of 4 will yield a very fast and reactive vario that responds almost instantly to vertical movement and offers little dampening of ascent and descent swings associated with turbulence. This setting is recommended for very smooth-air conditions. A setting of 0 will provide maximum filtering – however, the vario response will seem dampened and sluggish. This setting is useful in turbulent conditions or for pilots who prefer not to be distracted by a very active variometer. If you are unsure of your preference, a setting of 2 or 3 is recommended. The effects of this setting can be seen and heard in Simulation mode or in test flights, and the vario response delay can then be adjusted up or down as desired.
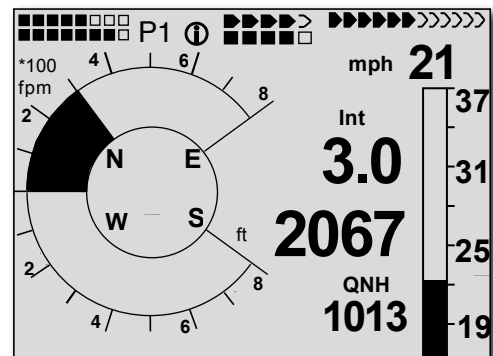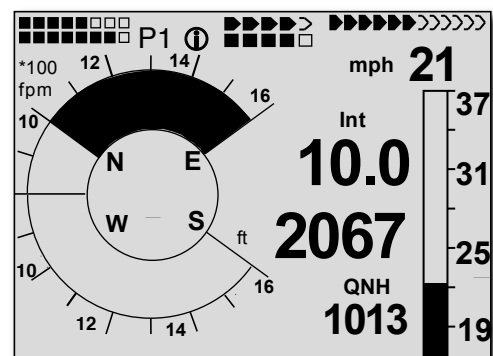

**Fig. 2** Vario = 1000 ft/min

Tip: Using FlyChart Software (*Extras>Flight instrument options*), all of the vario characteristics can be easily set and tested with the tone simulator.

2.3.2   Digital Vario

The digital vario appears to the right of the analog vario dial and just above the absolute altimeter; it has a resolution of 10 ft/min (0.1 m/sec). The digital variometer has a very wide measuring range of +/-14,000 ft/min (+/- 70 m/sec). It is therefore capable of displaying extreme vertical speeds such as those found in skydiving and base-jumping.

2.3.3   Descent/Ascent Tone

To enable the pilot the ability to monitor vertical speed without looking at the instrument, the 6040 can be set up to provide three different acoustical tones that will indicate if the balloon is ascending or descending and if the rate is increasing or decreasing. Ascent is indicated with a beep tone where the beep frequency increases with increasing ascent rate. Descent is indicated with a beep tone where the beep frequency decreases as the descent rate increases. Finally, if the descent rate increases beyond the preset alarm threshold, the beeping will become a steady tone where the pitch gets progressively lower as the descent rate increases.
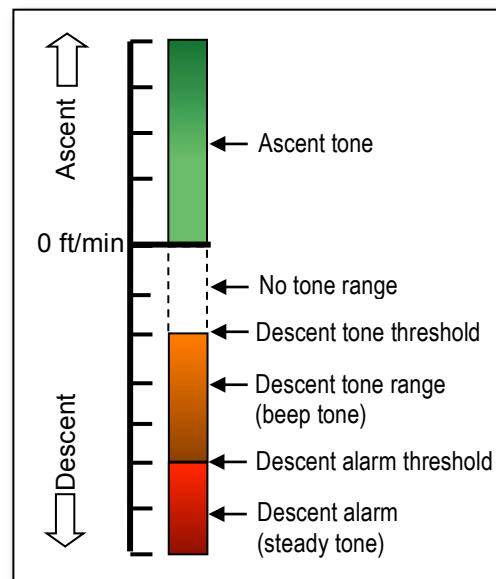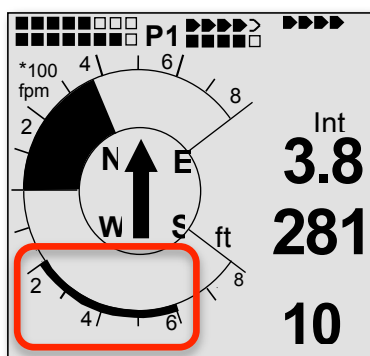
The thresholds can be set in *Menu> Settings>Variometer>Sink tone threshold*. The descent tone and descent alarm limits are shown on the vario dial. In the example, the descent tone starts at 200 ft/min and the descent alarm starts at 600 ft/min. The frequency of the starting point of the descent tone can be set in *Menu>Settings>Variometer>Customize sound*. The ascent tone can be enabled or disabled in *Menu>Settings>Variometer>Customize sound>Rise acoustic: yes/no*

Audio Level: The volume of the alarm can be adjusted between off and 100% in 25% increments using a short press of the ◀ key. Each press of the key will increase the volume by 25%. The Information Field will confirm the new setting (*0*, *25%*, *50%*, *75%* or *100%*) and a confirmation beep will sound.

2.4 Speed

Using the internal GPS, the 6040 can very accurately display the speed over ground (**ground speed**). Using an optional plug-in external vane sensor, the 6040 can very accurately display the **wind speed** (when on the ground).

2.4.1   Wind Speed

When the optional Vane-Wheel Sensor is plugged in to the 6040, the wind speed can be displayed in the *Wind speed* user-field. The sensor is quite sensitive and can measure speeds as low as 1 mph or 1 km/h. Measuring errors resulting from manufacturing tolerances can be corrected by applying a sensor correction factor in *Menu>Settings>Speed>Vane wheel correction*. The factory default value is 100%.

2.4.2   Ground Speed

Ground speed is calculated from the internal GPS and is shown on the analog speed scale on the right side of the Main page. The speed display can be set to display speed in mph, kph or knots in *Menu>Instrument setup>Unit*s. The speed is also shown digitally at the top of the analog scale. There are two possible ranges for the analog speed scale: the lower scale, 0-25 mph, and the upper scale, 0-37 mph. The scale for the analog display can be set in *Menu>Settings>Speed>Speed scale range*. If the ground speed exceeds the scale range, the value can be read on the digital display.
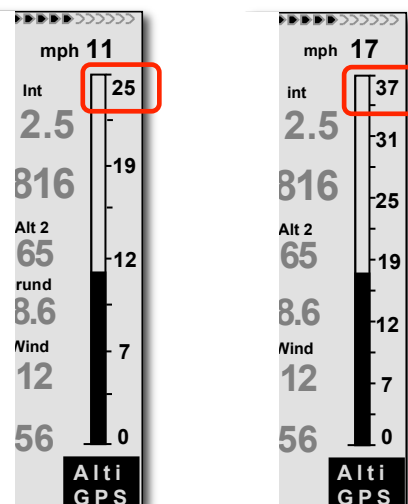
2.5 Time and Date

The 6040 contains a real-time clock and will display your local time in the *Time* user-field. It is not necessary to set the time and date since it is automatically set and corrected by the GPS receiver when the GPS has fixed its position. It is, however, necessary to set your local offset from Greenwich Mean Time (**UTC**). If you do not know your local UTC offset you can determine it from Internet resources like www.time.org. The UTC offset can be set in *Menu>Instrument setup>UTC offset.* It is also possible to enter half-hour time zones by adding a 0.5 h shift to the set time zone.

2.6 Ambient Temperature

The 6040 uses an internal temperature sensor, not only for compensation of the pressure sensors but also for automatically regulating the contrast of the display. The temperature can be displayed in the user-field *Temp* and can be set to Fahrenheit or Celsius in *Menu>Instrument setup>Units*. Note that the sensor measures the temperature **inside** the 6040 housing. The temperature inside the housing can be higher than the ambient air temperature (especially when the unit is in direct sunlight), or lower after a rapid descent.

2.7 Envelope Temperature

When used with the optional Flytec TT34 wireless envelope temperature sensor, the 6040 will display the balloon envelope temperature in the user-field *EnvTemp*. It is possible to set an **envelope temperature warning** (maximum continuous temperature) as well as a **maximum temperature alarm** (never-exceed temperature). In order for the 6040 to receive and display the envelope temperature, the serial number of the TT34 must be set in *Menu>Instrument settings>TT34 Serial number*. The serial number of the designated TT34 will show on the 6040 Start-Up page.

In the event that the 6040 is used without the TT34, the Receive function of the 6040 can be turned off with a short press of the *TempRX* key. In this case, *"Off"* will be displayed in lieu of the TT34 signal strength display (top of the Main and Windlayer pages). The Receive function can be switched back on with a short press of the *TempRx* key.

2.7.1   Envelope Temperature Warning

If the envelope temperature exceeds the user-set threshold, the 6040 will alert the pilot with an audible double beep every 10 seconds and the value in the *EnvTemp* user-field will be shown as white numbers on a black background (to draw attention to the exceeded limit). This audible and visual alert will continue until the envelope temperature falls below the threshold, however, the acoustic alert can be silenced with a short press of the *OK* key. Additionally, while the user-set threshold is exceeded, the *ⓘ* icon will appear in the status line at the top of the display; a short press of the *ⓘ* key will bring up the **Error page** with the message, *Envelope temp high!* Press the *Esc* key to exit the Error page and go back to the previous page or the display will go back automatically after 8-seconds. The acoustic alert can be permanently disabled in *Menu>Settings>Temp Alarm*.

To set the Envelope Temperature Warning threshold, long-press the *Temp* **((•))** key to bring up the temperature warning set-mode. The Information Field will appear as shown with the numerical value being the threshold for the envelope temperature warning. The limit value can be adjusted with the ▲ ▼ keys. The warning temperature can be set between 158º F and the manufacturer's never-exceed temperature.

2.7.2   Maximum Envelope Temperature Alarm

The Maximum Envelope Temperature Alarm is pre-set to a default value recommended by the manufacturer and can be displayed in the user-field *MaxEnvTemp.* It is set in the 6040 prior to delivery and cannot be altered by the user. If the envelope temperature reaches the alarm threshold, the 6040 will alert the pilot with an audible double beep every 5 seconds and the value in the *MaxEnvTemp* user-field will be shown as white numbers on a black background (to draw attention to the exceeded limit). Unlike the temperature warning, the maximum temperature alarm cannot be silenced and will continue until the envelope temperature falls below the maximum envelope threshold. While the maximum temperature is exceeded, the *ⓘ* icon will appear in the status line at the top of the display; a short press of the *ⓘ* key will bring up the **Error page** with the message *Max ENV temp Exceeded!* Press the *Esc* key to exit the Error page and go back to the previous page or the display will go back automatically after 8-seconds. For obvious reasons the Maximum Envelope Alarm cannot be disabled.

2.8 TT34 Envelope Temperature Transmitter

The TT34 switches on and off automatically based on a difference in temperature inside the TT34 housing and inside the balloon envelope. The limits that must be exceeded for the TT34 to turn on are a temperature differential of 27ºF (15ºC) and an envelope temperature greater than 122ºF (50ºC). The TT34 will automatically switch off 30 minutes after the envelope temperature falls below either criterion. When the TT34 is active, it transmits the envelope temperature every 4 seconds. When the 6040 is receiving the TT34, the strength of the reception will be shown on the TT34 Signal Strength indicator on the Main (as shown) and on the Windlayer page.
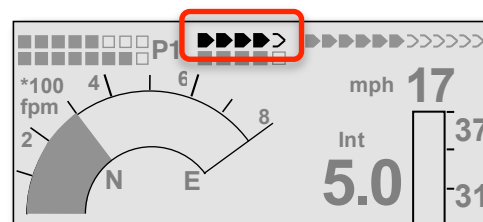
2.8.1 Pairing

Each TT34 has a distinct code number (i.e., serial number) that must be entered into the 6040 so that the 6040 may receive envelope temperature information sent by that TT34. When this code is entered into a 6040 the instrument will only receive temperature information from the paired TT34. This prevents the 6040 from receiving another pilot's envelope temperature information when flying in close proximity at flying events. The TT34 code can be set into the 6040 in *Menu>Instrument Settings>TT34 Serial number*.

If the 6040 is receiving a TT34 other than the one set the 6040's instrument settings, the *Env Temp* user-field will show **?- -?** and the *ⓘ* icon will appear in the status line at the top of the display. A short-press of the *ⓘ* key will bring up the **Error page** with the message, *Receive wrong TT34 = xxxx*, where xxxx is the code of the TT34 actually being received. In this case, the F2 (Store ID) key gives the pilot the option to quick-set the received TT34 code into the Instrument. This feature is very handy when the pilot uses the 6040 in multiple balloons and looses track of which TT34 currently overhead. To exit the Error page and return to the previously displayed page, short-press the *Esc* key or the display will go back automatically after 8-seconds.

If the 6040 does not receive its designated TT34 within 2 minutes of switching on, the 6040 will give an alert tone and the *ⓘ* icon will appear in the status line at the top of the display. A short-press of the *ⓘ* key will bring up to the **Error page** with the message, *TT34 no signal*. Press the *Esc* key to exit the Error page and return to the Main page. As long as the 6040 is not receiving a TT34, the *Env Temp* user-field will display **- -**

2.8.2 Battery Status

The TT34 runs on a single 9-volt alkaline battery that will last approximately three years in standby mode or approximately 200 hours of switch-on time. When the 6040 is receiving a TT34, it will show the battery status of the TT34 battery just below the TT34 Signal Strength indicator. The battery status scale is not proportional; the TT34 battery should be replaced when the indicator is less than full. The Signal Strength and Battery Strength indicators also appear on the Windlayer page.
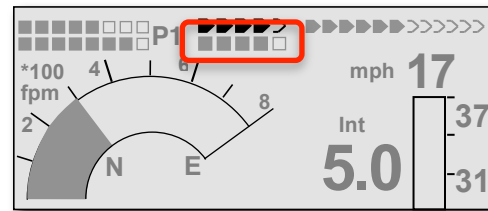
2.8.3 Sensor Failure

If the TT34 is malfunctioning, the symbol **--¦ ¦--** will appear in the *EnvTemp* user-field and the *ⓘ* icon will appear in the status line at the top of the display. A short-press of the *ⓘ* key will bring up the **Error page** with the message, *TT34 Defective*. To exit the Error page and return to the previously displayed page, short-press the *Esc* key or the display will go back automatically after 8-seconds. To prevent the recurrence of the error message during that flight, short press the *TempRX* key to turn off the receive function of the 6040. In this case, *Off* will be displayed in lieu of the TT34 signal strength display (top of the Main and Windlayer pages). Of course, prior to the next flight, contact Flytec for service on the malfunctioning TT34.

2.8.4   Installation

The TT34 unit must be mounted on the outside of the envelope in accordance with attachment diagram in section 10. The temperature sensor must be securely attached to the inner surface of the envelope so that the red sensor is in contact with envelope fabric (shown below right). **Please see Section 10 for proper TT34 installation.**

> **Important: The TT34 installation must be done exactly according to the installation diagram in Section 10. Any deviation can cause improper operation, inaccurate readings and/or damage to the TT34.**

3   Navigation

3.1 GPS – Global Positioning System

In Earth's orbit there is a network of navigation satellites. Using the signals from these **global positioning satellites (GPS)**, it is possible to very precisely determine your position anywhere in the world. Therefore, the use of GPS receivers has become indispensable for flight navigation and competition. The 6040 has a built-in GPS receiver that can receive up to 16 satellites at the same time. When the 6040 is turned on, the internal GPS receiver is automatically turned on.

A **Satellite Almanac** table in the GPS receiver keeps track of the path, location, and time of all satellites with reference to the receiver. The Almanac is continuously updated during signal reception. If the receiver is turned off for only a short period of time (less than 2 hours), it should take 1 to 2 minutes to acquire the location. Buildings, mountains or thick forest affect reception quality. Therefore, you should always look for the clearest view of the sky. The antenna is located under the "GPS" label and should face upwards, at least until it has locked onto several satellites. Because the received strength of the satellite signal is only 1/1000 that of mobile radios, these radio receivers and other disruptive factors (like notebook computers) should be kept as far away as possible from the 6040.

When the 6040 is turned off, power is still supplied to the Almanac's memory. If the power to the instrument is disrupted completely (e.g., batteries are removed or are completely dead), or if the 6040 is moved 125 miles or more (when it is not turned on) from the last reception point, then the Almanac must be re-established. In this case it can take 10 minutes or more to determine your new position.

3.2 Assessment of GPS Reception Quality

After turning on the instrument, it must receive signals from at least four satellites to fix its position for the first time. Once the GPS receiver has fixed its position, three satellites are sufficient for 2D positioning and at least four satellites are required for 3D positioning. However, if you want to record GPS altitude in the flight record, then at least four satellites are necessary. With 3D positioning, the 6040 will display GPS-derived altitude in the *Alt GPS* user-field.

The arrowhead bar-scale in the top right corner of the Main and Windlayer pages shows the number of satellites being received. Each filled-in arrow represents one satellite with good reception. The greater the number of filled in arrowheads, the better the overall GPS reception. As soon as the instrument has adequate GPS reception after switch-on, the 6040 will automatically update the internal clock (time/date) from the GPS signal (if necessary).
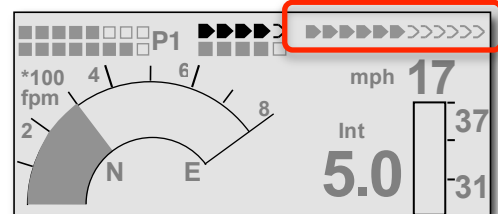
The position error is between 7 m and 40 m depending on the number of received satellites and their position relative to the 6040; on average the position error is approximately 20 m.

3.3 Compass and Flight Direction

In contrast to a normal magnetic compass that is oriented to magnetic north, the GPS compass can show direction only when the user is moving. However, it has the advantage that it is not subject to any grid deviation and does not show any deviation as a result of ferrous or magnetic material. Its zero point always corresponds with true geographic north (0 or 360 degrees).

The **compass rose** appears in the inner circle of the analog vario dial, however, the compass cardinals (N-E-S-W) are not shown until the GPS has acquired a position fix. If you have selected a Goto point, then a direction-to-destination pointer appears inside the compass rose. However, if groundspeed is less than 3 km/h the compass and pointer are static (north up). Your exact course (i.e., the direction you travel over ground) is always at the top of the compass, but can also be displayed in the *Track* user-field.
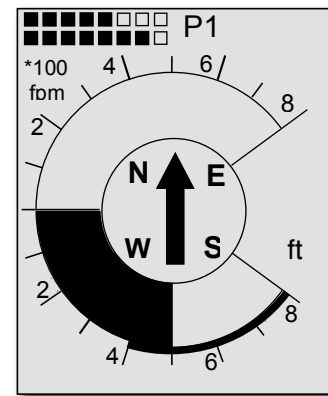
3.4 Track, Bearing and Cross Track Error

Track is defined as the route of the balloon over the ground and can be displayed in the user-field *Track*. **Bearing** is the heading in degrees to a desired point and can be displayed in the user-field *Bearing*. Geographic true north is always 0 or 360 degrees (east 90, south 180, west 270 degrees). The bearing is the direction to a specific destination or waypoint from the glider.

Cross track error is the perpendicular distance to the active leg of a **route** and can be seen in the user-field *XT Error*. Positive *XT Error* indicates that you are to the right of course line (Pos 1 in figure). Conversely, a negative value shows that you are left of course line (Pos 2). If you fly past the next WP in a route (not a Competition Route), a virtual line is extended past the WP and the XT error is given in relation to the virtual line (Pos 3). If you do not have an active route and you choose a waypoint with either the *Goto* or the *Route* key, then a virtual line is drawn from the position where you invoked the *Goto* or *Route* function to the waypoint. The cross track error is your perpendicular distance to that virtual line. The same applies if you are in an active route and you change the active leg with the *Prev/Nxt WP* function. If a **Competition Route** is active, the virtual line is drawn between the position where you crossed the last turnpoint cylinder and the next turnpoint.
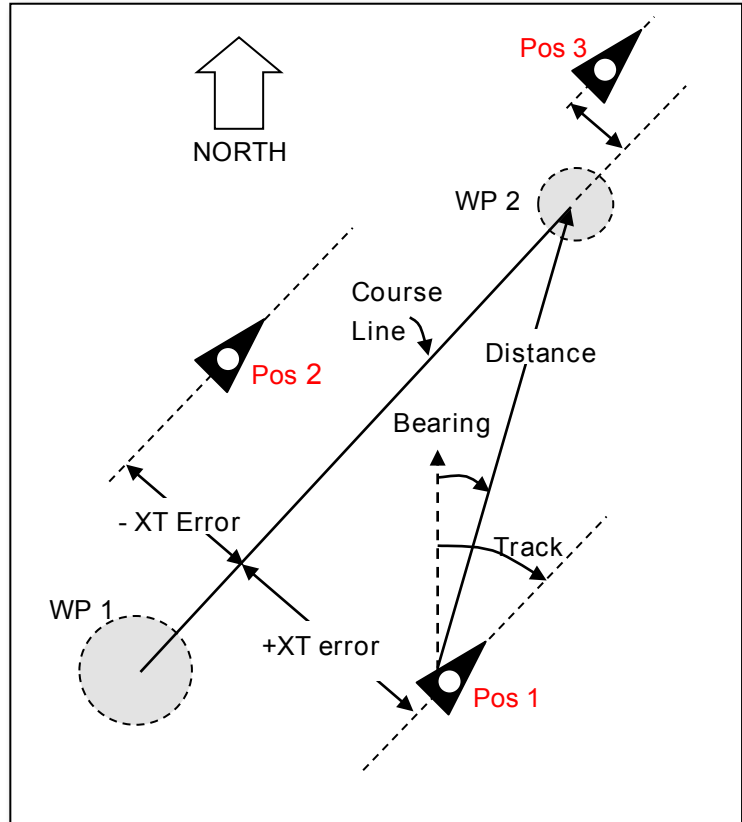
The precision of the XT Error depends on the length of the active leg of the route, with the greatest error occurring when you are centered between two waypoints of a route. For example, if the leg is 50km the error can be as much as 400 meters. This error is due to the very flat angles that result from being off-track a relatively small amount proportional to a long leg.

3.4.1   Distance to Take-off

The 6040 determines that a flight has begun when it observes an altitude change of 100ft (30m) or ground speed of over 6 mph (10 km/h) for more than 60 seconds. This is referred to as **flight acceptance,** and the 6040 notes the coordinates of that point. If the GPS has not yet fixed its position at the time of take-off, flight acceptance will be determined solely on the altitude change requirement. At any point during the flight, the distance to the take-off point (flight acceptance) can be seen in the user-field *Dist Toff*.

3.4.2   Flight Duration

When the 6040 determines that a flight has begun (flight acceptance) it records the take-off time into the Flight Memory. The elapsed time of a flight can be seen during the flight in the user-field *Flt Time*. The 6040 will also automatically recognize the end of the flight when the ground speed is less than 6 mph (10 km/h) and the vario is less than 20ft/min (0.1 m/sec) for 60 seconds. Only flights that are at least 3 minutes long are saved in the Flight Memory. The 6040 can be set to start and stop recording manually instead of automatically in *Menu>Settings>Recording*. For more information on flight recording please see Section 4.

3.5 Waypoints and Coordinates

A **waypoint (WP)** is any single point on the earth's surface to which you would like to go. The 6040 can save up to 200 different waypoints. Each waypoint can include a user-assigned name up to 17 characters, the waypoint's coordinates and waypoint altitude.

The 6040 GPS uses the **World Geodetic System 1984 (WGS84)**. This reference system assumes that latitude is measured from the equator (0 degrees) to the North Pole (90 degrees north) and to the South Pole (90 degrees south). Longitude is measured from the Greenwich meridian (London, 0 degrees). East is positive (up to 180 degrees), and west is negative (up to -180 degrees).

In addition to the international system WGS84, many countries use their own map references wherein the coordinates for the same point may differ slightly. Since the FAI Sporting Code General Section 2006 (7.3.1.1) states that the only valid GPS system for calculating distances is WGS84, the 6040 does not allow different geodetic systems.

The following position formats (for input and display) can be selected in *Menu>Instrument Setup>Coordinate format*:

Degrees, Minutes, Decimal places of minutes: dd°mm.mmm
Degrees, Minutes, Seconds: dd°mm'ss″
Degrees, Decimal places of degrees: dd.ddddd
UTM (a grid with a 1 km raster in both E/W and N/S directions)
Swiss grid

To achieve the greatest position accuracy, the format dd°mm.mmm (factory default) should be used because this is the format used by GPS receivers. With the other formats, rounding errors could add up to 15 meters in the worst case.

The 6040 can also understand waypoints entered according to the convention of using the first three letters of the waypoint name followed by three numbers for the altitude in tens of meters. For example, *LAB167* indicates a waypoint with the name LABxxx and an altitude of 1670 meters MSL. This altitude is stored in the waypoint's Altitude field.

3.5.1 Display Current Coordinates

Provided the 6040 is receiving a GPS signal, the actual position can be displayed in the Information Field by pressing the ⓘ key. After twenty seconds, the current position will be replaced by the information previously displayed in the Information Field. This function is useful after landing to relay your location to a person coming to retrieve you.

3.5.2 Saving the Current Position

If you wish to save your current position as a waypoint, once the GPS has fixed its position, press and hold the *WP* key for 3 seconds; "*Add Wayp*" will appear for *F1*; press the *F1* key to confirm. The current coordinates will be stored in the memory as a waypoint, and the 6040 will give a double beep as confirmation. The 6040 uses the letter M (for mark) for the first character of the waypoint name, along with the date and time. Example: *M.22.04 11:16:49* for 22 April 11 hours 16 minutes 49 seconds (UTC). Of course this waypoint name can be changed to a more meaningful name in the Waypoint
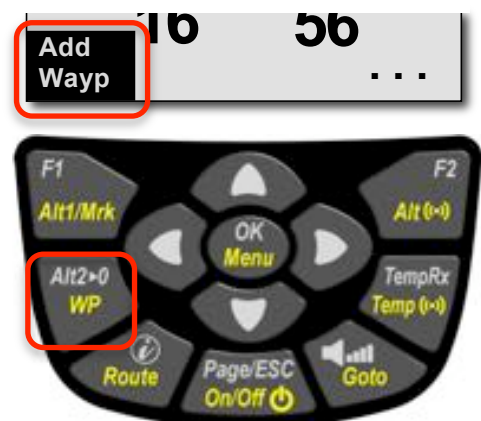
Menu. For more information on this **please refer to Section 3.5.3 below**.

3.5.3   Entering/Editing Waypoints

It is considerably easier to add waypoints to your 6040 using a PC and software that manages waypoints – such as FlyChart, SeeYou or CompeGPS. However, you can add waypoints to your list or edit existing ones using the 6040 keypad. To show the list of waypoints stored in the 6040, highlight *Waypoints* in the Main Menu and press the *OK* key. To add a waypoint, see below in this section. All waypoints are arranged in alphabetical order.

If the 6040 waypoint list contains more than eight waypoints, there will be a down arrow at the lower right edge of the list to show that additional pages of waypoints follow. To scroll down one page at a time, press the ▸ arrow; waypoints 9 to 16 will now appear, and so on.

```
┌────────────────────────────────────┐
│  Waypoints                         │
│ ---------------------------------- │
│ Colman                             │
│ Cheryl                             │
│ Ocala                              │
│ I27-474                            │
│ DS - 33                            │
│ Fantasy of Flight                  │
│ Astatula                           │
│ ---------------------------------- │
│      Used Waypoint 7/200           │
│ Astatula                           │
│ Alti       245 ft                  │
│ Lati     N  47' 55.116             │
│ Longi    W 011' 16.813             │
│ Ins.                         Del.  │
│ Wayp                         Wayp  │
└────────────────────────────────────┘
```

To edit a waypoint: select it from the waypoint list with ▼ ▲ keys and press the *OK* key. After pressing the *OK* key, the first letter of the waypoint name will blink; you can now change the first letter of the name of the waypoint by using the ▲ ▼ keys. There are numbers and letters, as well as a set of special symbols, to choose from. With the *F1* key you can switch between capital and lower case letters, and numbers. By pressing the ▸ key you acknowledge a character and move forward to the next character. A waypoint name can be up to 17 characters long. Once the waypoint name has been changed (or left as is), confirm the name by pressing *OK.* The blinking cursor will now advance to the waypoint's altitude field, and the value can be altered in the same manner as above. Confirm any changes that you have made, or accept the existing value by pressing the *OK* key.

The blinking cursor will now advance to the degrees/minutes portion of the waypoint latitude. The value can be changed with the ▼ ▲ keys – however, degrees and minutes are linked so you must scroll through all 60 minutes to advance to the next degree. Holding the ▼ ▲ keys down will change the values rapidly. Once the desired degrees/minutes appear, confirm by pressing the *OK* key. The cursor will now advance to the decimal minutes field and can be similarly set. Change the value as necessary and confirm, once again, with the *OK* key. The blinking cursor advances to the waypoint longitude, which can be altered and confirmed in the same manner as the latitude. **Note: Cylinder radius for any waypoint can only be set in the Competition Route.**

To delete a waypoint: select it with ▼ ▲ keys from the waypoint list and press the *F2 (Del Wayp)* key. To be on the safe side, the 6040 will ask for confirmation by showing, *"Delete Waypoint?"*. Use the ▼ ▲ keys to switch from *No* to *Yes*, and press the *OK* key. The deletion process can be stopped by pressing *ESC* key. The entire waypoint list can be deleted using *Menu>Clear/Initialize memory>Delete all WP & Routes*.

To add a waypoint, press the *F1 (Ins Wayp)* key when the 6040 is displaying the waypoint list. Enter the waypoint name, altitude, and position as described above. After you confirm all field entries with the *OK* key, the new waypoint is added to the waypoint list. A total of 200 waypoints (displayed in alphabetical order) can be stored in the 6040.

Note: Any newly entered waypoints can only be used after you have switched back to the normal run-mode by short-pressing the *ESC* key. In addition, you cannot enter new waypoints into an existing route if it is active. If the route is active, first enter Route mode by pressing and

holding the *Route* key, then press the *F2 (Cancel Route)* key to deactivate the route. For details, **see Section 3.6, Routes.**

3.5.4   Goto Function

Press and hold the *Goto* key to switch the lower half of the display into **Goto mode**. This function allows you to search for a waypoint stored in memory and select it as the next waypoint or goal. The closest five waypoints are displayed, with the nearest waypoint on top. The numbers after each waypoint name indicate its distance from your present location. You can search for a waypoint using the ▲ ▼ keys, and select it by pressing the *OK* key. The *Goto* function can be deactivated with the *F2 (Cancel Goto)* key.
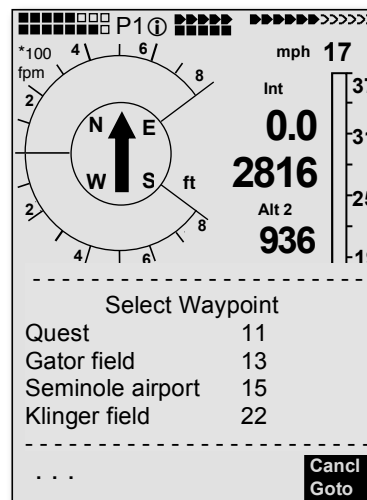
3.5.5   Distance to Waypoint/Goal

The horizontal distance to a waypoint can be displayed in the user-field *Dist WP.* This distance will appear if the instrument has switched automatically to the waypoint as part of the *Route* function, or if the destination has been chosen manually with the *Goto* function. If the 6040 has an active route, the distance around the remaining portion of the route to the goal (last waypoint) can be displayed in the user-field *Dist Goal*. For distances under 6.2 miles the resolution is 0.01 mile; if the distance is greater than 6.2 miles the resolution is 0.1 mile. The distance to a waypoint is always measured to the actual waypoint and not to the cylinder that may be around the waypoint in the case of a Competition Route. Distance to the cylinder can be seen in the user-field *Dist Cyl*.

3.6 Routes

A **route** is a sequence of waypoints to be flown in order. The 6040 can store up to twenty routes; the waypoints used on a route must first have been entered into the 6040's waypoint list. Each route can also be assigned a route name, for example, *Quest Air Triangle.* The same waypoint can be used more than once along a route, and the same waypoint may occur on other routes as well. If a waypoint is used in a route, it cannot be deleted from the waypoint list until the route is deleted. You can view the stored routes by highlighting *Routes* in the Main Menu and pressing the *OK* key. Up to eight routes are displayed on the screen at one time; use the ▶ arrow to display the next set of eight routes. While flying a route you have the option of looking up other, possibly closer, waypoints without leaving the current active route; use a long press of the *Goto* key in normal run-mode to do this.

It is possible to designate any previously entered route as a **Competition Route** which, in contrast to the routes described above, have mandatory cylinders around waypoints (such as turnpoints in a competition task or in FAI record/badge flights). **For more information on Competition Routes see Section 3.7**.

3.6.1   Enter/Edit Routes

It is considerably easier to add routes to your 6040 using a PC and software that manages waypoints/routes – such as FlyChart or SeeYou. However, you can add routes to your list or edit existing ones using the 6040 keypad. To show the list of routes stored in the 6040, highlight *Routes* in the Main Menu and press the *OK* key. The routes are listed in alphabetical order.

If the 6040 route list contains more than eight routes, there will be a down arrow at the lower right edge of the list to show that additional pages of routes follow. To scroll down one page at a time, press the ▶ arrow; routes 9 to 16 will now appear, and so on.

To create a new route: select *Routes* from the Main Menu, and press the *F1 (Ins. Route)* key. A new route with the default name *"Xxxxx"* will appear in the lower half of the display. The blinking cursor will be on the first character of the default name, which can be changed using the ▲ ▼ keys. Use the ▶ key to advance the cursor to the next letter, and accept the previous one. Repeat this process for each character of the name. Press the *OK* key to conclude the entry of the route name.

Next, the desired waypoints must be added to the route. Press the *F1 (Ins. Wayp)* key and the list of the available waypoints, in alphabetical order, will be displayed in the bottom half of the screen. The prompt *"Select Waypoint No1"* is displayed. Use the ▼ ▲ ▶ keys to scroll until the desired waypoint is highlighted. Add it to the route by pressing the *OK* key. The waypoint is then added to the list of waypoints in the route displayed in the upper half of the screen.

To add the next waypoint, press the *F1 (Ins.Wayp)* key again. Once more, the waypoint list appears, and you can select the second waypoint. After selecting the waypoint, press the *OK* key to add this waypoint to the route, and so on. The black-highlighted waypoint in the upper half of the screen is always the last one entered. The *F1 (Ins. Wayp)* key will insert the next waypoint after the one highlighted in black. To delete a waypoint, highlight it with the ▲ ▼ keys and press *F2 (Del. Wayp)*.

To alter a route: scroll through the *Route* list with the ▼ ▲ keys, and select the route with the *OK* key. The first letter of the route name is highlighted and can be altered (as can subsequent letters) with the ▼ ▲ keys. If you don't wish to change the route name, press the *OK* key to bring up the list of waypoints in the route. Waypoints can be added as described in the previous section. If you wish to change a waypoint in a route, first insert the new waypoint and then delete the old waypoint using *F2 (Del. Wayp)*.

To delete a route: scroll through the *Route* List with the ▼ ▲ keys, and select it with the *OK* key. Then press *F2 (Del.Route)*. The 6040 will ask: *"Delete Route?"*. Use the ▼ ▲ keys to change the *No* to a *Yes*, and then press the *OK* key. The entire Route List (with the exception of the Competition Route) can be deleted using *Menu>Clear/Initialize memory>Delete all WP & Routes*. **Note: It is not possible to delete the Competition Route.**

To cancel an active route: press and hold the *Route* key, then press the *F2 (Cancel Route) key*.

Note: An activated route remains enabled even after the 6040 is switched off and back on again. After switch-on of the instrument, a black direction pointer visible in the compass rose indicates that there is an active route or Goto.

3.6.2   Flying Routes

To activate a route, long-press the *Route* key; a list of your existing routes will appear in the lower half of the display. Highlight the desired route with the ▲ ▼ keys then press *OK*, and the name of the active route will appear in the Information Field. When you are flying with an active route, the next waypoint will be shown in the top line of the Information Field and *"next↑ pr↓ wp"* will appear in the bottom line. You can move forward to the next waypoint or move back to the previous waypoint using the ▲ ▼ keys.

In the middle of the compass rose, a solid black arrow points to the next waypoint. If there is more than one waypoint remaining in an active route there will be a second arrow (shaded) under the black arrow that points in the direction to the second waypoint. This second arrow makes it easier for pilots flying a competition task to know in advance which direction to turn after reaching the waypoint cylinder.

3.7 Competition Route

The 6040 Competition Route consists of a series of waypoints that are mandatory (i.e. start gate, turnpoints and goal) and is used to define a route for flying a competition task. The Competition Route differs from a standard route in that it allows you to enter task parameters established by the competition meet director or task committee. Generally in competition it is not necessary to fly to the exact coordinates of a waypoint, but only to a defined cylinder around the waypoint. For this reason the 6040 allows you to individually set the cylinder size for each waypoint in the competition route and will give a "turnpoint reached" audible alert when you fly into the cylinder. The distance to the cylinder can be seen in the user-field *Dist Cyl*.
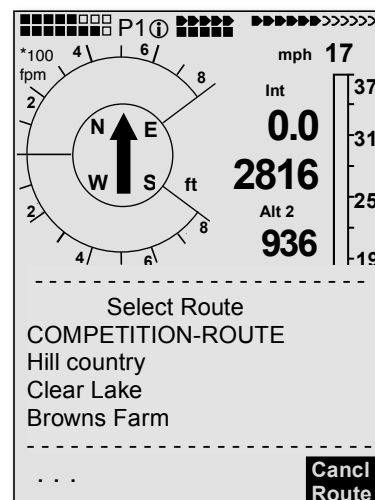
3.7.1 Setting Up a Competition Route

The procedure for creating a Competition Route is to first enter the task as a normal route and then copy this route to the Competition Route. To set a route as the Competition Route, select *Route* in the Main Menu, select the desired route with the ▲ ▼ keys, and press the *WP* key. The lower portion of the display will ask *"copy to Competition Route?"* Press the ▲ or ▼ key to change the *No* to *Yes* and press *OK.*

After a route is copied to the Competition Route you must set the start point and parameters and then adjust any turnpoint/goal cylinders that are not the default 400 meters. The cylinder radius can be individually set between 20 meters and 200 km for each waypoint. To set the start point for the task, highlight the desired waypoint from the list in the Competition Route and short-press the *WP* key. The selected waypoint will now have "*S*" after the cylinder size (default 400 m), and the lower half of the display will show the remaining start parameters to be set. Press *OK,* and then set the start cylinder size using the ▲ ▼ keys. Press *OK,* and then set the first start time. Press *OK,* and then set the interval between subsequent start gates. Press *OK* and set the total number of start gates. Press *OK* and set the start to *ENTER* or *EXIT*. In the example above, Quest is a 3 km Exit start with 3 start gates, and with the first start at 12:30 (followed by 12:45 and 13:00 start gates).

The cylinder radius for any of the remaining waypoints in the Competition Route must be individually set if it is different than the default 400 meters. To do this, highlight the waypoint from the list and press the *OK* key. The blinking cursor will be on the waypoint radius size. Adjust the value as needed, and press the *OK* key to confirm.
Repeat this process for all of the waypoints in the Competition Route. If the task calls for you to start and finish at the same point, be sure to correctly set the cylinder size for the goal cylinder,

since it is likely that the start and goal cylinders will be different sizes. Note in the example that the start is 3 km while goal is 400 meters.

3.7.2   Flying a Competition Route

The Competition Route can be called up by pressing and holding the *Route* key, and selected by pressing the *OK* key. For information on defining a Competition Route please refer to the previous section. When flying a Competition Route, it is possible to select additional waypoints (e.g., alternate landing fields) by pressing and holding the *Goto* key. The waypoints are sorted according to their distance from the pilot. The waypoints that are part of the Competition Route are marked with an asterisk in the displayed list, indicating that they must be achieved. The alarm remains active when entering a waypoint cylinder along the route, even if a waypoint not belonging to the route has been selected. Press the *F2* key to toggle back and forth between the waypoints of the Competition Route and another waypoint.

During an active Competition Route, the Map page will show a dotted line for the complete route and will also display the turnpoint cylinders around the turnpoints. If you access the Map page during a flight, a direction arrow will show your actual position. The track is drawn backwards from your current position towards the beginning of the flight. This way you will not have to wait for the entire track to be drawn to see your current section of the track.

After you have completed a flight using a Competition Route, the waypoints will be included in the track log (IGC file). SeeYou, CompeGPS, or other programs that can read and display IGC files can use your track log to determine whether the assigned task was completed correctly. **For more about IGC files, see Section 4.3.**

4   Flight Memory

The term "barograph" is not used with respect to the 6040 because a barograph is an air pressure (altitude) recorder and the 6040 records much more data than just pressure altitude. The flight logging system used in the 6040 records not only the flight altitude (from atmospheric pressure) and GPS altitude, but it also logs the time, position (in the WGS84 coordinate system), and ground speed.

4.1 Flight Recording Setup

The default **Recording mode** on the 6040 is automatic, meaning that is not necessary to manually activate the flight recorder. The 6040 can be set to manual recording in *Menu>Settings> Recording>Recording mode.* The default recording interval is ten seconds but can be changed in *Menu>Settings>Recording>Recording Interval* to a value between 2 and 60 seconds. A recording interval of 10 to 20 seconds is recommended for normal flying, and 2 seconds is recommended for performance testing.

Automatic Recording: With the Recording mode set to automatic, and after the GPS has fully fixed its position, the 6040 will start recording when the it recognizes that a flight has begun (**flight acceptance**). This occurs when the ground speed is greater than 6 mph (10 km/h) for at least 60 seconds, or when there is a change in altitude greater than 100 ft (30m) within 60 seconds. To ensure that the flight recording includes the very beginning of a flight, the 6040 will include the 30 recording points prior to flight acceptance. For example, with the recording interval set to 10 seconds, the flight recording will include the 5 minutes (30 x 10 sec) before flight acceptance. When flight acceptance occurs, the *Flight Time* user-field will begin to advance.

Flight recording will continue until the *On/Off* key is pressed for 3-seconds. When this is done the 6040 will display the Flight Analysis page. The **Digital Signature** (a checksum used to verify that the flight record has not been tampered with) is calculated at this moment. Please wait until the calculation is completed – you can then return to the standard display with a brief press of the *Menu* key. A flight must be at least three minutes long, and must have an altitude difference of at least 100 feet (30 meters), to be logged into memory. **For more on the Digital Signature, please see Section 4.3.1.**

Manual Recording: If manual recording is selected, recording starts 2 minutes after the instrument is switched on (to allow any necessary settings to be made before recording starts). Once recording starts, it will continue until the *On/Off* key is pressed for 3 seconds. At this time the display will show *"really switch off??"*. To confirm the end of recording and begin the generation of the Digital Signature, press *OK*. This can take one or two minutes; please wait until the process is complete.

It is possible to set a marker in the track log of a flight by pressing the *Mrk* key for 3 seconds. Of course the GPS must have fixed its position, and flight acceptance must have occurred. The marker will be set in the E record in the IGC file

4.2 Flight Memory

To view your stored flight records, highlight *Flight Memory and Tracks* in the Main Menu and press the *OK* key. The records are stored according to the date of each flight, shown in the left column, with the most recent flight on top. The length of the flight is also shown, in the right column. On this page, individual flights can be deleted from the list by pressing *F2 (Del. Flight)*. To view a flight, use the ▼ ▲ keys to move through the list and choose the desired flight with the *OK* key. The flight, with its benchmark figures, is then displayed on the Flight Analysis page.

```
          Flight Memory
-----------------------------------
15.03.09                  0:43:12
13.02.09                  1:37:34
28.01.09                  0:44:05
23.01.09                  1:02:24
12.12.08                  0:54:55
24.11.08                  1:07:32
```

Important: Although the 6040 will store up to 100 flights, it is recommended that the Flight Memory be downloaded routinely to FlyChart, SeeYou, or some other program and then cleared using *Menu>Clear/Initialize memory>Delete all flights*. This procedure provides security to your recorded flights and allows the 6040 to record new flights with "refreshed" memory.

4.2.1 Flight Overview

The Flight Analysis page shows an overview of the flight: date, start and stop time, duration, tracklog recording interval, max for Alt 1 and Alt 2, cumulative altitude (A3), max envelope temp, max and min vario and max ground speed. If the 6040 is left on the flight analysis page it will automatically power down after 30 minutes.

It is possible that the max values shown on the Flight Analysis page will not agree with the max values shown in your flight evaluation software (FlyChart, SeeYou, CompeGPS, etc.). This is because the 6040 updates its max values each second, whereas flight evaluation programs analyze the data contained in the flight track log and it is quite possible that the maximum value has occurred between recording points. For example, if the 6040 recording interval is set to 10 sec, and within a 10-second period an altitude change of 20 meters occurs, a climb rate of 2.0 m/sec will be

```
-------------------------------------
FLIGHT ANALYSIS
-------------------------------------
Date:     13.02.09   UTC
Start:    13:02:02   UTC
Stop:     15:55:32   UTC
Flight time:    2:53:30
Scanrate:    10 s

Max A1:   5823 ft
Max A2:   2154 ft
Max A3: 14273 ft

Max Env Temp:   258 F
Max Vario (10s):   320 ft/min
Min Vario  (1s):     210 ft/min
Max Speed: 12 mph
Show                       Recal
Map                        Sign.
```

calculated by a flight evaluation program. However, within this 10-second period it is quite possible that a momentary climb rate greater than 2 m/sec occurred. Due to the 6040's 1-second update rate, the Flight Analysis page would show the higher value. Flight Analysis page data is not transferred when flights are downloaded to a PC.

4.2.2   Track Map

The track logs of saved flights can be viewed on the 6040 display. Go to the Flight Analysis page (see steps above) and then press *F1 (Show Map)*. The track log appears on the display. North is located at the top, and waypoints are displayed with a + sign and the name. The map scale is displayed in the lower right corner of the map. The view can be changed as follows:

*F2 key (Zoom In)***:** The scale of the map is halved each time the *Zoom In* key is pressed, to a maximum of 0.2 mi. Thus individual circles during a climbing period will be clearly recognizable (depending on the recording interval setting).

*F1 key (Zoom Out)***:** The map scale is doubled each time the *Zoom Out* key is pressed, to a maximum scale of 29.5 mi. Thus the complete flight can be seen on the screen (except for particularly long flights).

◀ ▲ ▼ ▶ *keys (Pan)***:** With these the plotted area can be shifted up, down, left and right.

OK: From any view, jump back to display the complete flight.

ESC: Back to the Flight Memory Menu. Any other key will cause the track in the current flight to be redrawn.

Note: When the pan and zoom functions are used it will take a few moments to redraw the map/track (*"Wait"* and *"Ready"* will correspondingly appear in the Information Field). If a zoom or pan key is pressed while a map is being redrawn, the original redraw will be suspended and will start over again with new pan/zoom selection. This allows you to quickly view the desired section of the map.

4.3   IGC File

Flights stored in the 6040 are saved in a secure IGC (International Gliding Committee) format and can be downloaded to flight verification programs to score a competition flight, participate in on-line contest, or prove a record flight. Flight data including time/date, GPS coordinates, GPS and pressure altitude, and speed are recorded at a preset interval. This interval can be set in *Menu> Settings>Recording>Record interval*. Also contained in the IGC file are the take-off and landing points, the declared route (Competition Route), the user-set pilot and aircraft information and instrument information. The take-off position is the GPS location where flight acceptance occurred. The landing position is the position where the instrument recognized the end of the flight (this is the point where the 6040 switches to the Flight Analysis page after landing). With these features, the
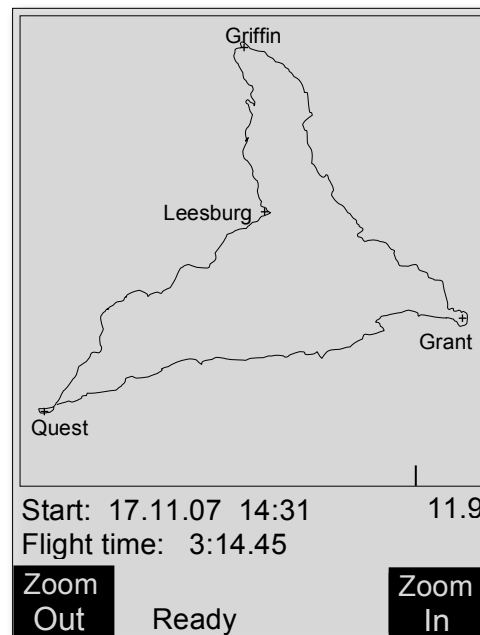
instrument is in compliance with Section 7 part D of the FAI Sporting Code. More detailed information in regard to IGC file format is available on the FAI Website under: *http://www.fai.org/gliding/gnss/tech_spec_gnss.asp.*

Once a flight has been download to a PC it is possible to view the raw data contained in the IGC file by opening it with a text editor. It is also possible to import the data into a spreadsheet program like Excel for advanced data analysis. **For more on viewing IGC data, please see Section 6.7.**

4.3.1   Digital Signature

To prove a flight, the FAI (Fédération Aéronautique Internationale) and its subgroup IGC (International Gliding Committee) require a recording format that continuously records the time of day, GPS position and flight altitude at regular intervals. To make the recording tamper resistant a **Digital Signature** is also required. If only one character of the flight data contained in the IGC file were altered, this signature would no longer be valid and the judging committee would be aware of the manipulation.

At the completion of a flight the 6040 automatically generates a Digital Signature and saves it within the IGC file (G-Record). During this process the 6040 will display "*Generating Digital Signature*" in the Information Field. This calculation is very complicated and can take up to several minutes to complete for a long flight with frequent recording intervals. Due to this complexity it is possible that an error is made when generating the Digital Signature. In this case a scoring program my reject the flight. In most cases, this can be remedied by going to the Flight Analysis page of the flight and pressing *F2 (Recal Sign.)* to recalculate the Digital Signature. After the Digital Signature is recreated re-download the flight to the scoring program.

5 Restricted Airspace (CTRs)

While flying, there are areas pilots must avoid such as regulated airspace, danger areas, cables, wildlife protection areas or fields prohibited by a competition organizer. The 6040 refers to these avoidances as **Airspaces** (or CTRs) and it is possible to enter up to 300 airspaces into the active memory of the 6040 and virtually unlimited CTRs can be stored and accessed using an SD card. Airspaces loaded into the 6040s active memory will be shown on the Map page when you are flying in their vicinity. The instrument will also provide proximity alerts and display the airspace details when entering the warning distance and when entering the actual airspace. The distance to the nearest airspace can be seen in the user-field ***Dist CTR***. If you fly under an airspace floor the user-field ***Alt Allowed*** will show the maximum allowable altitude. *Alt Allowed* will show - - if there is no airspace floor present or if you enter an airspace. Airspace can be entered into the 6040 in three ways:
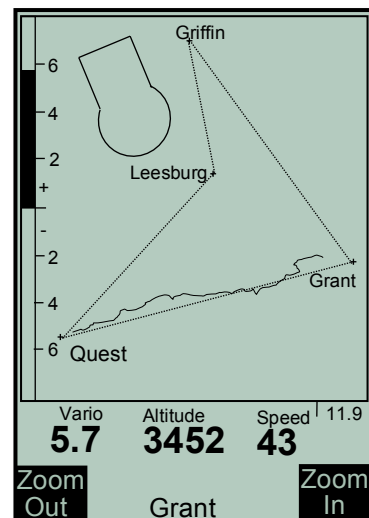
Direct upload via PC: up to 300 airspaces can be loaded into the instrument memory using a PC and flight software like FlyChart, GPS Dump, etc. This method is common at competitions where the meet staff compiles an airspace file and uploads it via the USB connection. No SD card is required. Instructions for this method are in section **Error! Reference source not found.**

Pre-load CTR file on to an SD card: Airspace files are compiled on a PC and saved to an SD card. The SD card is loaded into the 6040, the desired airspace file is selected in the SD-Card menu and the 100 closest airspaces of that file are automatically loaded into the airspace list (after the instrument gets a GPS fix). With this method it is possible to build airspace files for entire states, countries, continents or even the world and always have the correct airspace loaded when you move from one flying site to another. Instructions for this method are in section 5.2

Manual entry: CTRs can be entered/edited via the 6040 keypad. This method is very tedious and would likely only be used to edit an existing airspace or to add 1 or 2 airspaces to an existing list. Manual entry is discussed in section 5.2.2.

Important: The Airspace function is only a tool. The pilot is solely responsible for staying out of airspace and avoiding obstacles. Due to the fact that the 6040 calculates distance (point-to-point) there can be considerable error when calculating the distance to a CTR if the shortest distance is to a straight leg of the airspace rather than to one of the actual points that define the CTR. Consequently, if your approach to the airspace is

5.1   Airspace Alerts and Info

There are different types of airspace and it is possible to select which types will be warned according to the three options below. This can be done in the Main Setup Menu >Settings> CTR Alarm (select 0, 1 or 2). The list of airspace types is later in this section.

CTR Alarm = 0: No acoustic warning and no automatic display of the CTR info page. The CTR info page can always be called up with a short press of the information key.
CTR Alarm = 1: Single acoustic warning when entering the warning distance and Single acoustic warning when entering the airspace. The CTR info page is automatically shown for 10s with broken threshold highlighted.
CTR Alarm = 2: Single acoustic warning when entering the warning distance and a double acoustic (high pitch-low pitch) when entering the airspace. The CTR info page is automatically shown for 10s with broken threshold highlighted.

The warning distance of an individual airspace is usually set in the airspace file but can be modified on the instrument (see section 5.2.2) and applies to the horizontal and vertical distance to the airspace. However, since approaching the floor of an airspace from below is usually relatively slow (climbing in a thermal as opposed to gliding), an additional alert is given at 50m below the airspace floor (purple line in the diagram below) regardless of the warning distance set for the airspace. See following diagram.

Sample airspace: Warning distance 400m (CTR alarm set to 2)
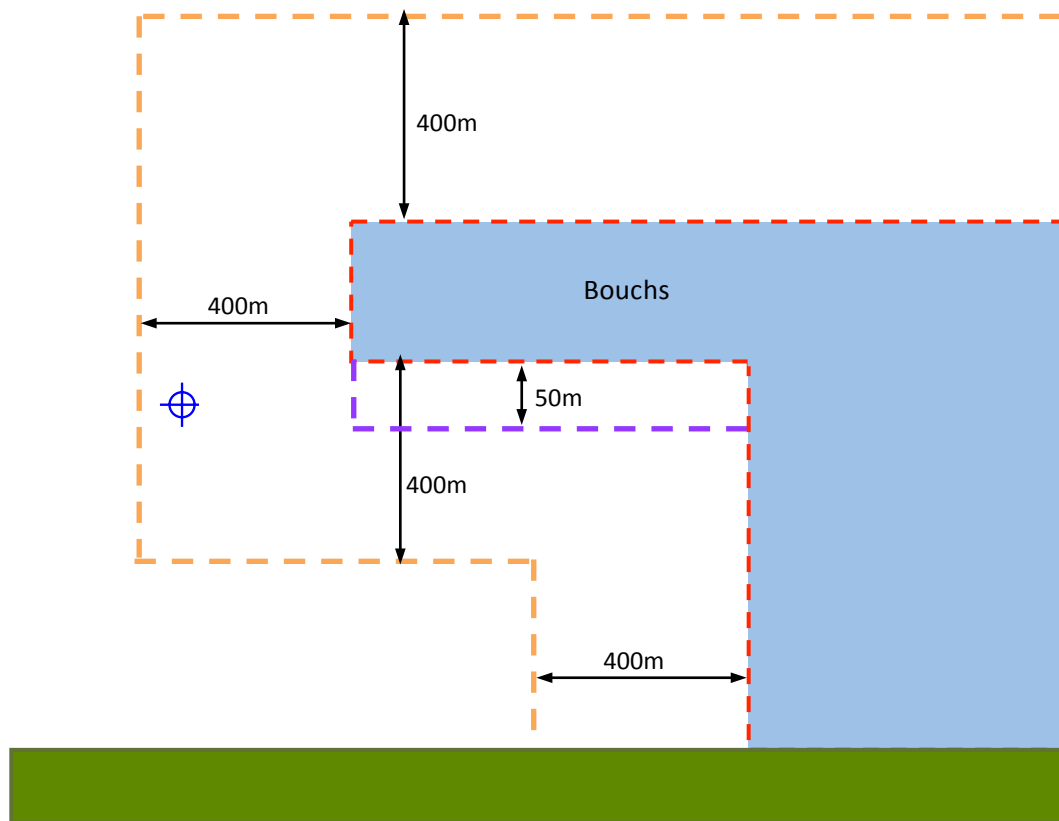
In the example above, crossing the orange or purple line yields single tone alarm and brings up CTR Info Page. Crossing red line yields double tone alarm and brings up CTR Info Page. A pilot at the blue target is inside the 400m horizontal warning distance and therefore would have received the single tone alarm and CTR info page would be automatically displayed. Note: since the horizontal distance is the threshold that was broken, the warning distance is highlighted (figure at right). On the other hand, if the warning distance in the vertical direction was broken the Low/Up parameter would have been highlighted. The distance to the nearest Airspace can also be seen in the user-field *Dist CTR.* The display is limited to distances of 50 km. If you enter a airspace, the *Dist CTR* will display 0.00

In the example above, the airspace type is CTR, the following are the available airspace designations:

D   Danger Areas
AWY   Airways
FIZ   Flight information zone
CTR   Controlled airspace
TMA   TMA
R   Restricted Areas
TSA   Temporary segregated areas
VZ   Forbidden zones
FLF   Airways
HPO   Heliport

GG   Danger Areas
HI   Obstacles (e.g., cables)
SZ   Wildlife protection area
BB   Cable car

5.1.1 Recalling Detailed Airspace Information

The CTR info page can be called up anytime with a short press of the *i* key and the five closest airspaces are shown. To see the details of one of the displayed airspaces, highlight the desired airspace with ▲▼ keys and short press the OK key. The details will be shown as in the example at right.

Typically OpenAir files will only contain the name, perimeter and floor/ceiling limits of the airspace. However the instrument is capable of displaying all of the info shown in the example at right. You can add this additional information into an OpenAir file with a text editor using the following tags. After doing this, make sure you process the file with the OpenAir2faf program so it can check your entries and give a warning if typos or mistakes are found (see section 5.2).

```
---------------------
  CTR BUOCHS (MIL C
---------------------
Class:  D
Type:  CTR
Designator:  LSZC
Radio 1:  TWR:119.625
Radio 2:
Radio 3:
LowerLevel:  0m
UpperLevel: 3950m
Warning Distance:400m
ActualDistance:  374m
Status:  On
Comment:
```

Label in the instrument	Tag in OpenAir
Name:	AN (max 16 characters)
Class:	AC
Type:	AT
Designator:	AD (ICAO Designator)
Radio 1:	AR1 (max 16 characters)
Radio 2:	AR2 (max 16 characters)
Radio 3:	AR3 (max 16 characters)
LowerLevel:	AL (in meter without units)
UpperLevel:	AH (in meter without units)
Warning Distance:	WD (in meter without units)
Actual Distance:	374m (nearest distance from the actual position)
Status:	AS (0 = Off, 1 = On)
Comment:	CO (max 16 characters)

If the airspace name in the OpenAir file has more than 16 characters, the last character is truncated and a serial number in the order of occurrence in the OpenAir file will be added. The airspace above will appear in the faf file as follows;

```
AC D
AT CTR
AD LSZC
AR1 TWR:119.625
AR2
AR3
AN CTR BUOCHS (MIL C
AS 1
WD 400
CO
AL 0
AH 3950
DP 47:01.817 N 008:20.300 E
DP 47:00.617 N 008:18.550 E
DP 46:57.033 N 008:19.950 E
DP 46:57.550 N 008:20.283 E
DP 46:57.683 N 008:21.867 E
```

```
DP 46:57.417 N 008:22.067 E
DP 46:57.350 N 008:22.500 E
DP 46:57.417 N 008:23.433 E
DP 46:56.383 N 008:23.633 E
DP 46:56.767 N 008:25.567 E
DP 46:57.217 N 008:27.867 E
DP 46:58.467 N 008:27.933 E
DP 46:57.917 N 008:28.667 E
DP 46:57.767 N 008:30.683 E
DP 46:58.917 N 008:30.350 E
DP 47:02.233 N 008:28.717 E
DP 47:01.567 N 008:27.967 E
DP 47:02.250 N 008:26.833 E
DP 47:02.350 N 008:25.900 E
DP 47:02.650 N 008:25.967 E
DP 47:02.417 N 008:24.317 E
DP 47:01.817 N 008:20.300 E
*
```

5.1.2 Deselect or select individual airspace

If you start your flight under an airspace whose lower is limit is higher than you could possibly reach that reach day, you can cancel this airspace to prevent unnecessary warnings. It is possible to deselect up to 3 airspaces. Any deactivated airspaces are reactivated on restart of the instrument.

To deactivate an airspace, short press the **i** key to bring up the CTR info page, select the desired airspace with the ▲▼ keys and press the F1 key (Cancel CTR). The airspace is deleted from the CTR Info page and the next closest airspaces move up the list. The number of canceled airspaces is shown at the bottom of the page (just above the GPS coordinates). Canceled airspaces are shown on the map page with dotted boundary.

To reactivate the canceled airspaces press the F2 key (React CTR) on the CTR info page. Any canceled airspaces are also re-activated if they fall out of the 100 nearest airspace list. Therefore, if you fly back towards the start, the previously canceled airspaces will once again be active as they are reloaded into the active airspace memory.
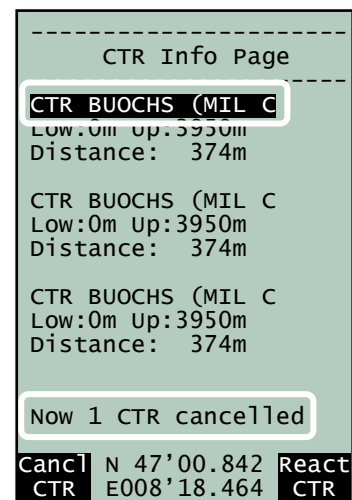
5.2 Airspace on an SD card

Using an SD card it is possible to load unlimited airspaces into the 6040. Individual airspaces are assembled into airspace files (region, state, Province, country, continent, etc,). Airspace files can be generated on a PC from **OpenAir** files found on the Internet using the Flytec airspace utility. The airspace file is then loaded onto an SD card. With the SD card loaded into the 6040, the instrument will search for the SD card for the 100 closest airpaces and load them into the 6040 Airspace menu. As you fly from one location to another the 6040 will update its list of 100 airspaces from the SD card. Airspaces are shown on the map page and alerts will be given when flying near (or within) an airspace according to the CTR alarm type set (see section 0). Pressing the **i** key at anytime will bring up the info page which will show info for the 3 closest CTRs.

The most common air space file is **OpenAir,** which should have a .txt extension. Unfortunately the internal format of these files is not standardized over the various sources. Consequently the air space file must first be processed by a small Flytec program **OpenAir2faf** available on the Flytec website. This small program checks to see if the format is correct and, if necessary, corrects any errors. In order for this file to be read by the 6040, the file name must be 8 characters or less with
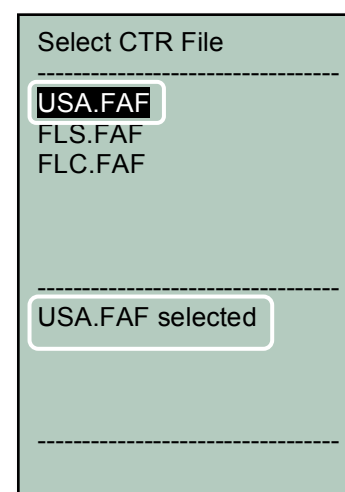
the extension .faf and must be contained in a folder named CTR in the root directory of the SD card. The .faf file created by the OpenAir2faf program is a standard text file and can be viewed and edited using any text editor, however, care should be exercised when editing an airspace file to avoid making an incorrect change to a airspace boundary. The 6040 will accept airspaces to a maximum of 100 vertices, the OpenAir2faf program checks the OpenAir file and will give a warning if any of the airspaces exceed the 100-vertex limit.

Properly constructed .faf files may be available from fellow pilots, the local flying community, competition staff, etc. In which case you can simply copy the file into a folder named CTR on an SD card and insert the card into the 6040. The instructions for creating an .faf file and saving to an SD card are in the section 5.2.2.

5.2.1 Using Airspace loaded on the SD card

Since there can be multiple .faf files in the CTR folder. The selection as to which file is used must be made in *Menu>Main Setup Menu>SD-Card>Select CTR file*. Highlight the desired airspace with the ▲▼ keys and press OK. The display will confirm the file you chose as "selected" in the lower portion of the display. This selection can also be made during the flight. This is useful if you cross a border for example and the file needs to be changed.
If the selected file is valid, the instrument examines all the air spaces and loads the closest 100 CTR's into the instrument memory. This can take up to 10 minutes depending on the size of the .faf file. Once the 100 closest airspaces have been loaded into the instrument memory the instrument finds the 3 closest airspaces and their respective data can be displayed by pressing the info key. This information is recalculated every second. The 6040 periodically checks the distances to the unloaded airspaces in the active .faf file on the SD card and if you have moved closer to any of these, the instrument updates the airspaces accordingly. Consequently, when the 6040 is in use, the instrument memory will always contain the 100 nearest airspaces.

```
Select CTR File
---------------------------------
USA.FAF
FLS.FAF
FLC.FAF


---------------------------------
USA.FAF selected


---------------------------------
```

If you add or change air spaces on the instrument the instrument will ask, when exiting the Airspace menu, if the change is to be written to the SD card. If accepted, the updating of the file on the SD card can take several minutes. The same also applies if you add new CTR's or make changes to the airspaces in the instrument memory with FlyChart. If you read the airspaces from the 6040 with FlyChart the 100 CTR's in the memory will be transferred not the contents of the SD card.

Important! To avoid data loss or other malfunction, SD cards should only be inserted/removed when the instrument is switched off or in the Main Menu. It is recommended that you save your .faf files to a PC since SD cards are not infallible.

5.2.2 Create .faf file from OpenAir file and load to SD card

1. Locate and download an OpenAir text file for the region you want. Save the .txt file in a place where you can find it again (e.g. Desktop, folder named Airspace, etc.). If the file is zipped, unzip the file to the folder above. Some good resource are:

   Worldwide: http://soaringweb.org/Airspace/
   Germany: http://www.daec.de/fachbereiche/luftraum-flugbetrieb/luftraumdaten/
   Switzerland: http://www.flyland.ch/   (SHV members only)

2. Download the airspace utility ***OpenAir2faf.exe*** from www.flytec.com. Double click the file and the install wizard will guide you through the installation. After the installation is complete, three shortcuts (English, French, German) to the program will be added to your desktop (of course the other shortcuts can be deleted).

3. Double click the icon for the language you want to start the program.

Click button and browse to OpenAir file you downloaded in Step 1 and select the file.

Click button and browse to the location where the converted file to be saved to. The name of the converted file can be entered in the *File Name* field. Skip this step and the converted file will be saved to the same location as the source file with the same name but with a .faf extension. Note: In order for the converted file to be recognized by the instrument, the file name (preceding the .faf file extension) must be 8 letters or less.

Select feet or meters and set airspace warning distance

Click to process file and save to the location above

Upon clicking *Convert* the program will check to see if a file with the same name already exists. If the file exists, the program will ask if the file should be overwritten, or if the airspace in this conversion should be added to the existing file. If the conversion program finds errors in the OpenAir file it will display the problems found during the conversion in a list.

4. Create a folder named CTR in the root directory of the SD card (formatted Fat or Fat16)

5. Copy the .faf file created above into the CTR folder in the root directory of the SD card

6. Insert the SD card into the instrument and it will recognize the airspace the next time the instrument is turned on. The instrument will clear the internal airspace memory, search for the closest 100 CTR's in the specified file and load it into the internal airspace memory (the GPS must be acquired).
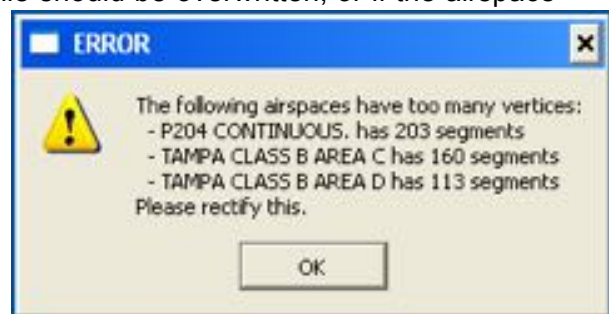
You can view the airspace file in FlyChart if you change the file extension from .faf to .txt
  * In FlyChart open *Flight instrument Options*, in the *Extras* menu
  * Click *Restricted* areas in left pane

- Click *Load* and browse to the file created above (with the .txt extension). The individual airspaces contained in the file are shown in a scrollable list and graphically in the center of the window.
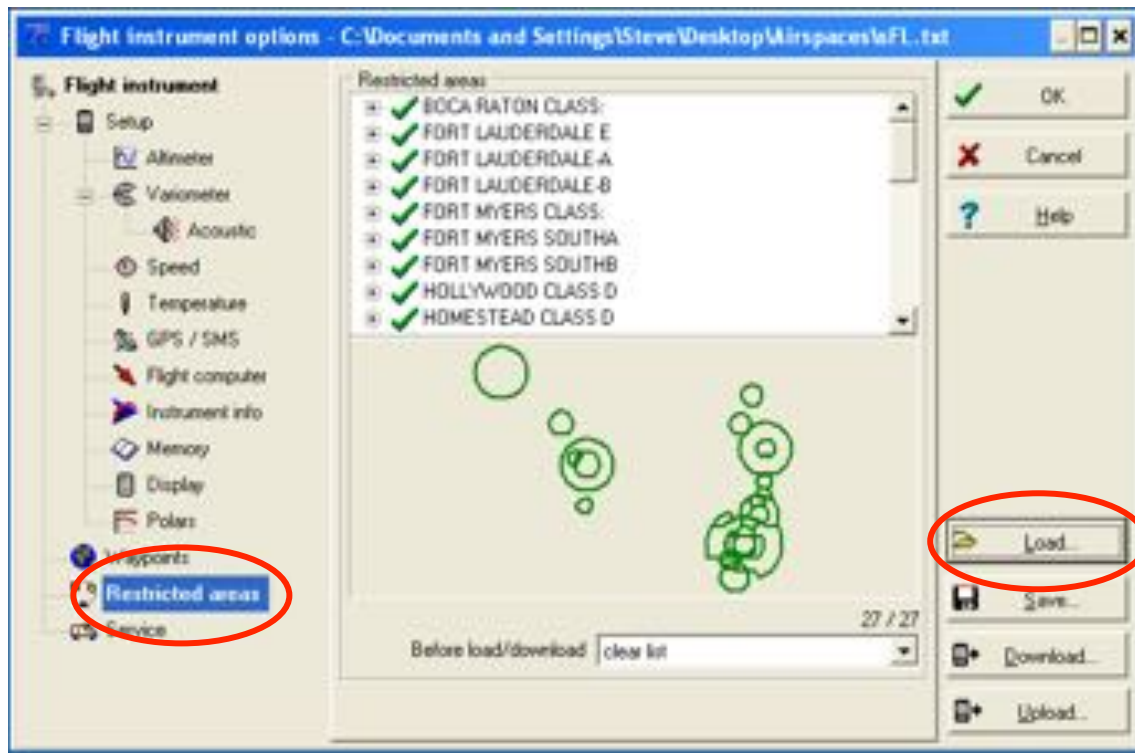
5.3 Entering Flight Airspace Manually

While it is possible to enter airspaces into the instrument manually using *Menu>Airspaces*, it is far easier using FlyChart or similar flight software (e.g., GPS dump). The procedure for editing/entering/deleting an airspace with the 6040 keypad is given below; the procedure for using FlyChart can be found in Section 6.4.

Stored airspaces can be viewed in the Airspaces menu within the Main menu. The 6040 comes with the Innsbruck airspace loaded, as shown at right. The names of any loaded airspaces are shown in the upper half of the display and the details (name, 17-character comment, warning distance and

the number of elements to define the shape of the area) for the highlighted airspace are shown in the lower half. The preloaded Innsbruck airspace can be edited to define a airspace in your flying area.

To enter an airspace, bring up the Airspace list from the Main Menu, press the F1 key (Ins. CTR) and then follow the instructions below for editing an airspace. To edit an airspace, highlight the desired airspace as described above and press the OK key. The cursor will now blink on the first
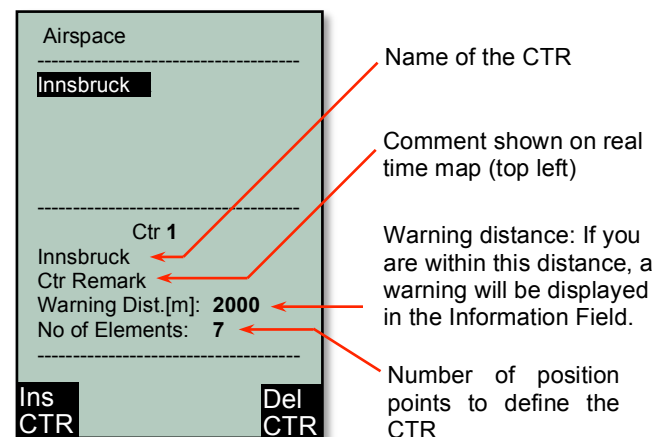
character of the airspace name and it can be changed with the ▲ ▼ keys. With the F1 key you can switch between capital letters and symbols, and lower case letters and numbers. Pressing the ▶ arrow key acknowledges a character and moves the cursor forward to the next character. Once the Airspace name has been edited (or left as is), confirm the name by pressing the OK key.

The cursor will now blink on the first character of the airspace Remark line. Edit the comment (if desired) in the manner described above, and then press the OK key to acknowledge the comment and advance the cursor to the Warning Distance field. Change the Warning Distance (if desired) in the same manner. Press the OK key to acknowledge the value and bring up the airspace element list. To select an element, scroll through the element types using the ▲ ▼ keys and press the OK key when the desired element is shown. The details of the element will appear in the lower half of the display and can be edited in the usual manner.

An airspace is defined by a series of **elements** consisting of end points of lines and arc segments, or by the center and radius of a circle. Each element must have its GPS coordinates and must be entered exactly in sequential order (clockwise or counter-clockwise). The instrument will automatically connect the last point entered to the first point, so it is unnecessary to repeat the first point at the end of the string. For mathematical reasons the distance between two points in an airspace should not be too far apart. The accuracy of the distance calculation will be increased if an intermediate point is inserted between two distant end points. The types of elements are:

Point:	End point of a line or arc
Center:	Center of an arc
Startborder:	Start point of an arc (+ clockwise/ - counter-clockwise)
Stopborder:	End point of an arc (+ clockwise/ - counter-clockwise)
Circle:	Center of the circle with radius in meters

When entering arc segments, observe the following parameters: Lat/Long of the arc center, Lat/Long of the start point of the arc segment, Lat/Long of the end point of arc segment, and rotational direction (+ for clockwise and – for counter-clockwise). When entering circles, the Lat/Long of the center and the radius in kilometers are sufficient.

Example:
Counter-Clockwise
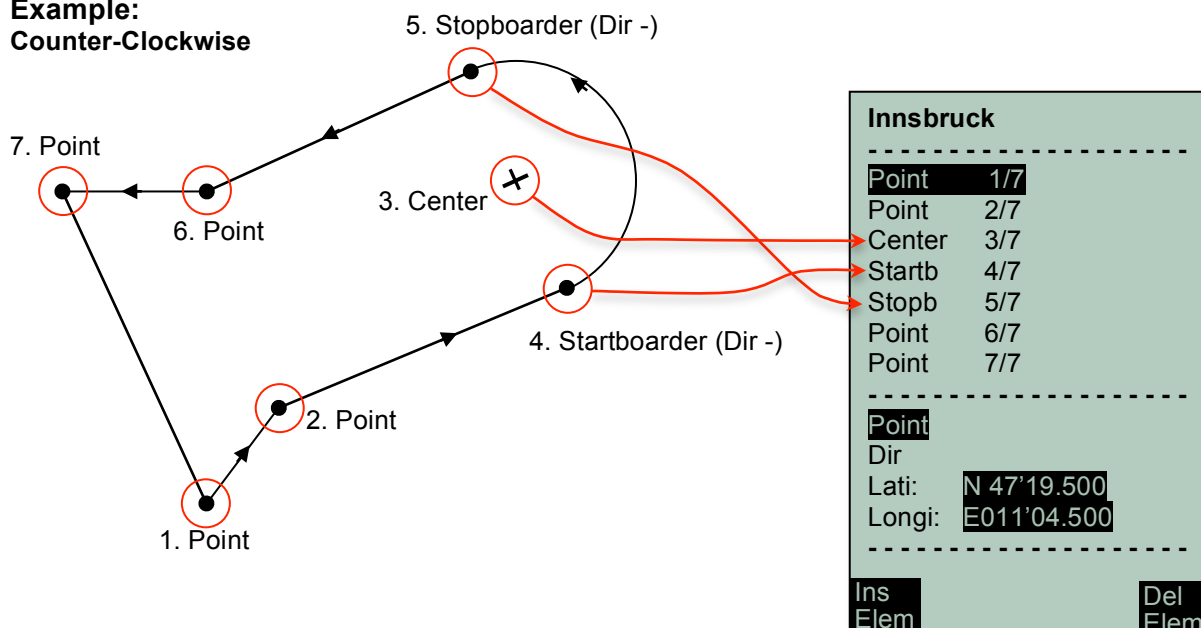
6   Connecting to a PC

Using FlyChart, it is possible to download the waypoints, routes, Airspaces, recorded flights and user-settings from 6040 to a PC. It is also possible to upload waypoints, routes, Airspaces and user-settings from the PC to the 6040. You can view your recorded flights over real-world terrain in Google Earth directly from FlyChart. And with a simple flasher program you can upgrade the 6040 firmware when new releases become available.

The 6040's basic equipment includes a USB data cable. In order for the 6040 to communicate with a PC, the appropriate USB driver must be installed on the PC. The driver name is PL-2303 and it is available at *http://flytec.com/Products/Software.htm*. If you install FlyChart 4.52.36 or later, the PL-2303 driver will be installed automatically.

6.1   Downloading Flights

To download a flight recording to a PC, go to the Flight Analysis Screen for the desired flight (under Flight memory in the Main Menu) and then follow the downloading instructions for the PC flight program. In FlyChart simply click the download icon on the task bar.

6.2   Instrument Settings

Using FlyChart it is possible to easily configure the 6040 from your PC. To do this, turn on the 6040 and enter the Main Menu, connect the USB cable to the 6040 and your PC, then launch FlyChart. In the FlyChart Extras menu select Flight Instrument Options and the window shown at right will open. Click the Download button, and the current 6040 settings will be downloaded. Click each of the headings on the left to see their associated parameter settings and make any desired changes. When all of the changes have been made, click the Upload button.
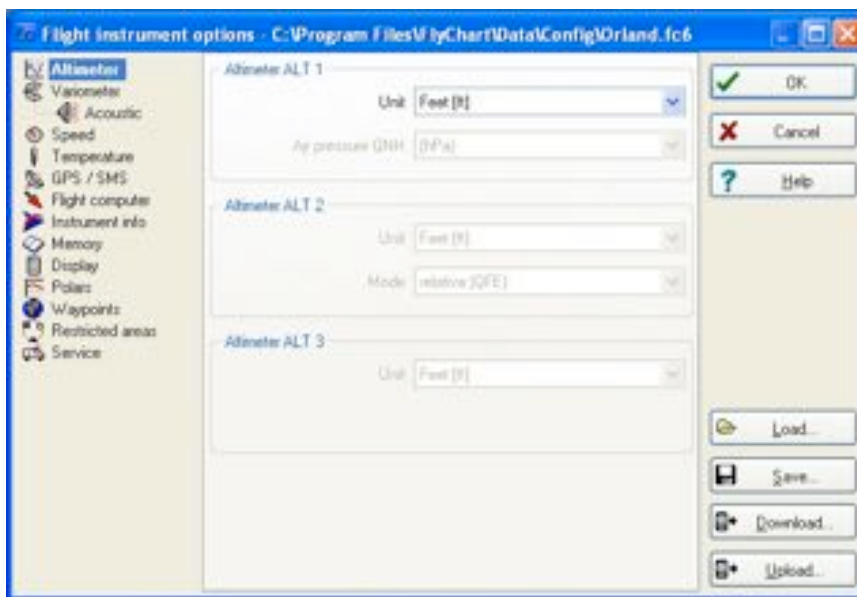
After the status bar shows the upload is complete, you have the option to save this configuration in FlyChart as the default 6040 configuration, or to save it under a different name when you click the Close box. In this way it is possible to save multiple configurations that can be quickly loaded into the 6040. To load a specific configuration click the Load button in this window, browse to the desired configuration and then click the Upload button.

6.3   Upload/Download Waypoints and Routes

To exchange waypoints and routes between a PC and compatible flight software (e.g., FlyChart, SeeYou, CompeGPS) enter the 6040 Main Menu and follow the instructions on the PC for the flight software. When uploading waypoints and routes, the 6040 checks whether their names already

exist, and if so the old names are overwritten. This search can take a little while so there may be pause between the time you click the Upload button and the beginning of the waypoint transfer. If the names do not already exist in the list, the new waypoints/routes are added to the existing list. **Note: You should make sure that transferred waypoints show up in the 6040 waypoint list before you transfer a route from your computer that uses these waypoints.**

To transfer waypoints and routes with FlyChart, open the Flight Instrument Options window (as described in the previous section) and click the Waypoints heading on the left side of the window. Click the Download button to pull the waypoints and routes from the 6040 into FlyChart. To load waypoints into the 6040, click the Load button in this window, browse to select the desired waypoint file and then click the Upload button. FlyChart can handle FlyChart *.fw5* files, SeeYou *.cup* files, CompeGPS *.wpt* and *.rte* files, GPS eXchange *.gpx* files, SwissMap 50 *.smo* files and Garmin files.
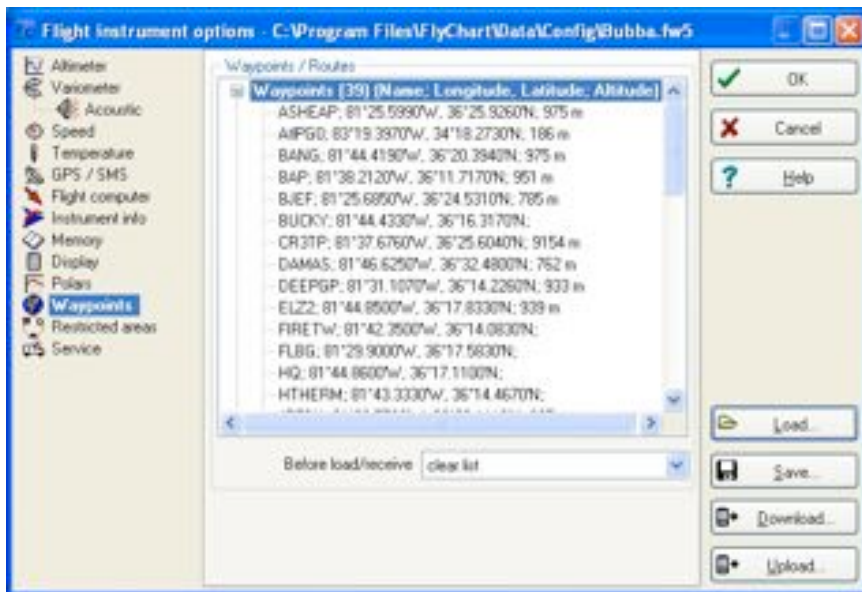
6.4   Uploading Airspace with FlyChart

Airspace to be avoided can be entered/edited/deleted in the 6040 manually as described in Section 5.3, or far more easily with FlyChart, as discussed below. Generally airspaces are assembled into a file will likely consist primarily of aviation authority airspaces (e.g., airports, MOAs, etc.) but may also include high-tension lines, government lands, unfriendly landowners, etc. Due to the processing power required for the 6040 to continually refresh the map and calculate distances, it is recommended that airspace files only contain individual airspaces that you could possibly reach during a flight. For this reason it is preferable to load the airspace file onto an SD card and let the 6040 automatically load, and update as needed, the 100 closest airspaces. For more information on this refer to section 5.2

```
*##    (CLASS B) ORLANDO (C1)
###
AC B
SB 0,150,255
AN MCO: 124.8 MHz
AL 1600AMSL
AH 10000ALT
DP 28:44:00 N   081:25:30 W
DP 28:45:45 N   081:25:00 W
DP 28:47:20 N   081:25:00 W
DP 28:48:40 N   081:25:20 W
DP 28:50:00 N   081:24:30 W
DP 28:50:00 N   081:02:30 W
DP 28:44:00 N   081:02:30 W

Note: the starting point and the
ending point do not have to be
identical.
```

Airspace files can be obtained from the Internet, fellow pilots, competition staff, etc. or can be built in FlyChart (see section 6.4.1). FlyChart is able to open airspace files in OpenAir format (**.txt* files) available from resources like http://soaringweb.org/Airspace/. These files are normally derived from an open database called DAFIF (see the disclaimer at the beginning of the **.txt* file). At right is an example of a airspace taken from a DAFIF file. The relevant airspaces within your flying area can be selected and saved to a file in FlyChart. You can create and save different airspace files for use when flying different flying sites. Other avoidances like power lines, wildlife refuges, etc. can be added to these files as needed. Airspace files saved with FlyChart will have the suffix **.fa5* and can be quickly loaded to the 6040. See section 6.4.1 for more information on creating an airspace file.

Once an airspace list has been built and saved with FlyChart (*.*fa5* file) it can be uploaded to the 6040 as follows. The following assumes that you have installed and set up FlyChart on your PC and have connected the 6040 with the USB cable.

1. In FlyChart select Extras>Flight instrument options.
2. In the Flight Instrument Options window select Restricted Areas, and an empty frame will open.
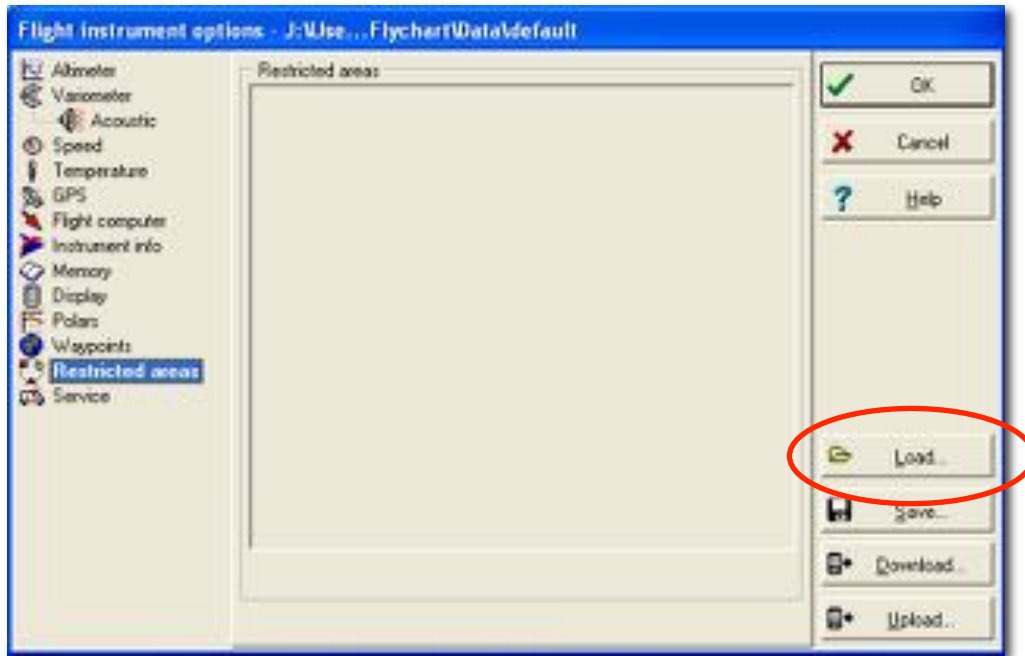
3. Click the Load button, browse to the location of your airspace file, select the desired restricted area file (*.fas, *.fa5, *.txt or *.smo) and click Open.

4. The boundaries of the airspaces will appear in the preview area below the airspace list. Airspaces marked with a green checkmark are "selected" and areas marked with an X are "deselected". Selected airspaces are shown with a solid green boundary line and deselected airspaces are shown with a dotted green boundary. Click on any airspace in the list and its boundary is shown in red.
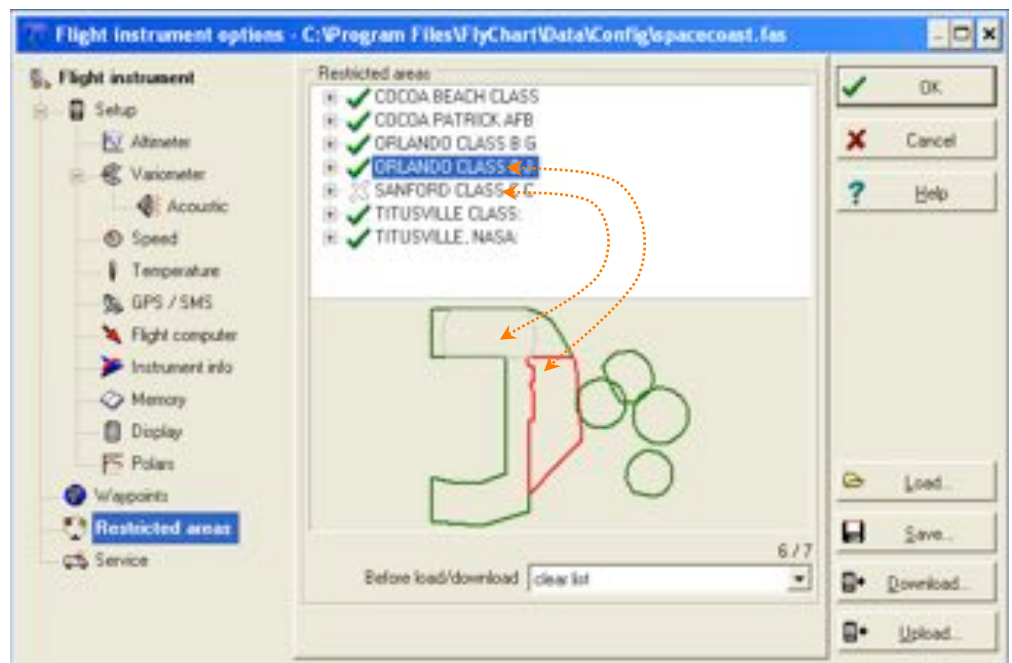
Only selected areas will be uploaded to the 6040 when the Upload button is clicked. Right-click on an airspace (in the list) to perform the following actions:

   Select>Toggle: Status of selected area is reversed (green check changes to X and vice versa).
   Select>All: All restricted areas will be selected and marked with a green check mark.
   Select>None: All restricted areas will be deselected and marked with an X.

To select a range of airspaces: left-click the first one and shift-left-click on the last one. To select multiple individual airspaces: Ctrl-left-click the desired areas. When selected, the group will be highlighted in blue and can be toggled on/off with a right-click. The desired areas will now be marked with a green checkmark and will be drawn in the graphic area. Clicking on any active (green checked) restricted area will cause that one to be outlined in red in the graphic area.

Since the 6040 needs considerable calculation power to refresh the map display and generate distance calculations, when selecting which airspaces to include in a airspace file, only select the ones you can realistically fly near.

5. After the desired Airspaces are selected and edited if necessary (see the section below on editing an Airspace), click the Upload button to send them to the 6040. Of course the instrument must be connected to the PC with the USB cable and turned on, and in the Airspaces menu. If the speaker is turned on, the 6040 will beep as the airspaces are loaded. If a problem occurs during transfer, a lower-pitched beep will sound. After uploading is complete you can confirm that the airspaces have been transferred by clicking the Download button in FlyChart and viewing, in the Restricted Areas frame, which restricted areas are actually stored in the 6040.

6. To save the airspace list you just made as a file on you computer (for later use or to share with fellow pilots), click the Save button, assign a file name, browse to the location you want the file saved (e.g., folder named Airspaces) and click Save.

Editing Airspaces

It is possible to edit the name, description, warning distance and boundary coordinates of an airspace. When an airspace file is opened, the included airspaces are listed alphabetically. Click the + symbol next to the airspace name to show the details for the airspace. Below the airspace name is the description, which is used for the lower and upper altitude limits; below the description is the warning distance. Any attribute of the airspace can be edited by right-clicking the item to be changed and selecting Edit from the dropdown menu. A name can only be used once, and the name and comment are limited to 17 characters each. Below the warning distance, the coordinates of the points that define the airspace boundary are listed sequentially. An airspace boundary is defined either by a sequence of points (p) and/or arcs (a) or as a circle (c).
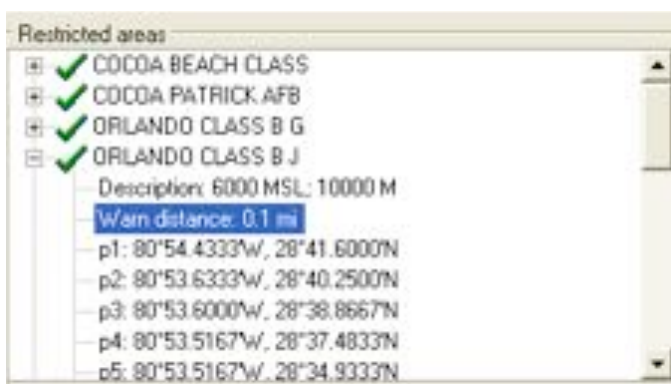
Example:
Counter-Clockwise
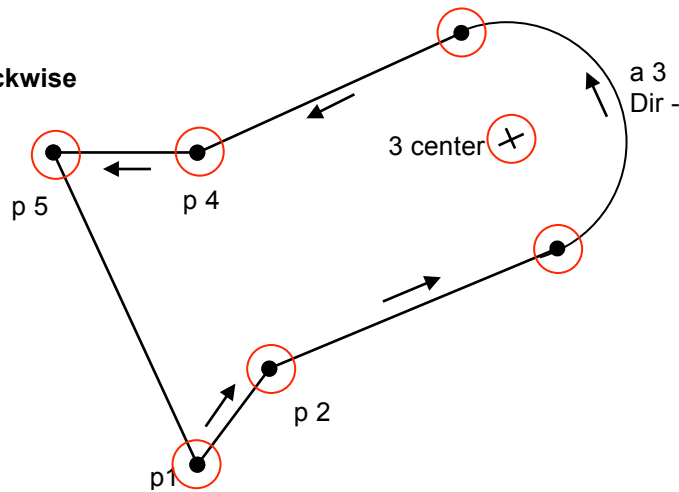
Arc segments: Arcs are defined in the following format: Lat/Long of the arc center; Lat/Long of the start point of the arc; Lat/Long of the end point of the arc; rotational direction (+ clockwise, - counter-clockwise).
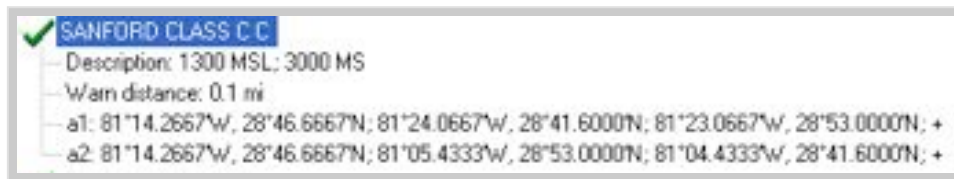
Circles: Circle are defined in the following format: Lat/Long of the arc center; radius in km

6.4.1   Creating an Airspace File with FlyChart

1. Obtain an appropriate regional airspace file in *.fas*, *.fa5* or *.txt* format
2. In *FlyChart>Extras>Flight instrument options>Airspaces* click Load, select the above file, and click *Open*. All of the airspaces contained in the file will be shown.
3. Select the airspaces that are relevant to you and/or deselect the ones that are not relevant (as described in item 4 of Section 6.4).
4. Alter individual airspace names, descriptions and warning distances to your preference.
5. If necessary, simplify complex airspaces by deleting points used to define parts that are not approachable.
6. If necessary, combine airspaces that are nested into each other.
7. Click the Save button, assign an appropriate new name and click OK to store this airspace file in FlyChart for future use.
8. Click the Upload button to send the airspaces to the 6040. If the speaker is turned on, the 6040 will beep while the airspaces are being loaded. If a problem occurs during transfer, a lower-pitched beep will sound.

Tip: Create and save different airspace files for your various flight locations and flight directions.

6.5 Transferring New Firmware to the 6040

Flytec is continually improving, adding features and enhancements to the 6040 firmware. Periodically Flytec AG and Flytec USA will post firmware at *www.flytec.ch* and *www.flytec.com*. To update the 6040 firmware, it is necessary that the 6040 USB driver is installed on your PC. If you have installed FlyChart 4.52.38 or later the driver should already be installed. If necessary, you can download the stand-alone driver from *http://flytec.com.*

To update the firmware, make certain the 6040 is turned **off** and connect the 6040 to your PC with the provided USB cable. The 6040 may start a high pitched beeping when the USB cable is connected, if this occurs, the cable must be unplugged and the 6040 turned off (if it turned on) before attempting to flash the firmware. Double click on the appropriate firmware file on the website and the dialog above right will open. Click *Run,* and the *Firmware Update* window shown right will open. The Flasher should automatically find the port that your 6040 is plugged into. Click the *Update* button; the firmware upload begins and a status bar shows the progress. Leave the 6040 undisturbed until the *"Firmware update is complete"* message appears.

Important: Due to memory reorganization that may occur during firmware updates, it may be necessary to clear the 6040 memory after upgrading the firmware (the firmware release notes will indicate if it is necessary). This can be done with the *Clear/Initialize memory* in the Main Menu. The firmware release notes will inform you which aspects of the memory need to be cleared (if any). **It is recommended that all flights, waypoints/routes and user-settings be downloaded and saved to FlyChart before installing new firmware, in the event memory clearing is necessary.**

Important: Never leave the PC cable hooked up to the unit when it is turned off. If this is done energy will be consumed, and the battery can be drained.

6.6 Optional Software

With the help of a release code obtainable from the Flytec AG or Flytec USA, additional special functions can be activated. To enter a release code:

- Select *Optional SW-Packages* from *Instrument Setup* in the Main Menu and press *OK.*
- Highlight the appropriate software package from the Optional Software Packages list.
- Press *OK* and the code 30000 will start blinking.
- Press the ▾ key; the code will jump to 30000.
- Use the ▴ ▾ keys to set the code obtained from Flytec and press *OK.*
- The 6040 display will display *"Package released".*

Note: If you enter a wrong code, the instrument will be blocked for 5 minutes or longer!

6.7   Viewing the Contents of an IGC File

To view the raw data contained in the IGC file, download the instrument with a flight evaluation program such FlyChart or SeeYou, save the flight as an IGC file and then open the desired flight file with a text editor. Or if technical analysis of data is desired, the IGC file can be imported into a spreadsheet program such as Excel. It should be noted that **any** changes made to an IGC file will void the Digital Signature contained in that file and created by the instrument to insure against manipulation. Consequently an IGC file that has been altered will not be accepted by scoring software. The steps for importing an IGC file to Excel are:

1. Select the Import command from *File>Menu* in Excel.
2. Select the Text file radio button in the dialog box.
3. Browse to the desired file, make sure *All Files* is enabled and click Open.
4. Select *Fixed Width* as the data type and click Next.
5. Set column breaks at 1, 7, 14, 15, 23, 24, 25, 30 and 35, and click Next.
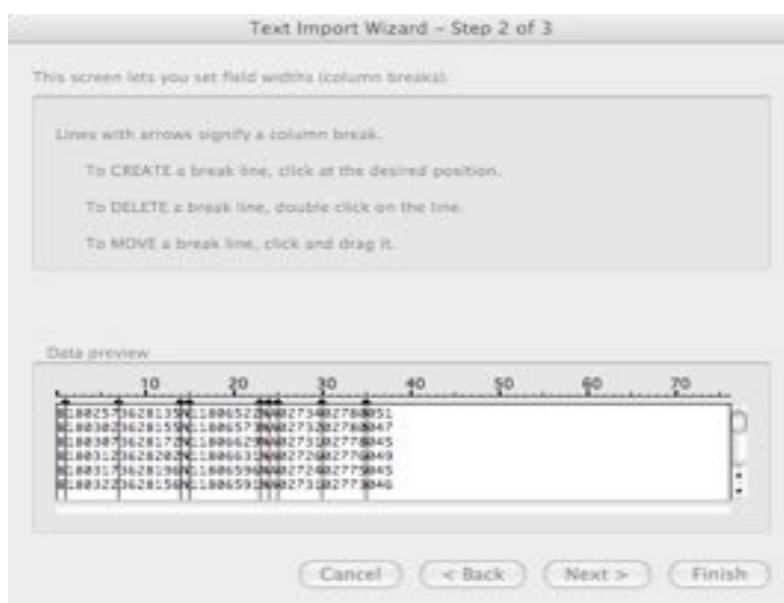
6. Select the General radio button and click Finish.
7. Select the New sheet radio button and click *OK.*
8. The data will now be visible in the spreadsheet. Several of the first lines of the IGC file are non-flight data and the column breaks set above will not appropriate. The text in these lines can be reformatted or deleted. Alternatively, these lines can be excluded from the import in Step 4 above.
9. The headings shown in the figure can be added and the column widths can be adjusted:

		Time UTC hh:mm:ss	Latitude dd mm.mmm	N/S	Longitude ddd mm.mmm	E/W	Fix A=3D V=2D	Altitude Ref. 1013hP	Altitude GPS	Speed kph
1										
2										
3	B	180150	3628350	N	11806875	W	A	2736	2773	55
4	B	180156	3628335	N	11806835	W	A	2737	2775	44
5	B	180201	3628322	N	11806801	W	A	2731	2776	44
6	B	180206	3628302	N	11806771	W	A	2741	2777	40
7	B	180211	3628273	N	11806747	W	A	2737	2777	44
8	B	180216	3628243	N	11806722	W	A	2735	2778	42
9	B	180221	3628217	N	11806693	W	A	2733	2778	43
10	B	180226	3628188	N	11806667	W	A	2734	2779	45

10. The latitude and longitude values are in the XX°XX.XXX' format. For space reasons, the degree and decimal symbols are omitted from the IGC file. For example, the latitude value 3628350 above should be read as 36º 28.350'. Using the number format code ##"º" ##"."### in Excel for the latitude and longitude columns, the coordinate data can be expressed in the XX°XX.XXX' format.

◇	A	B	C	D	E	F	G	H	I	J
		Time UTC	Latitude		Longitude		Fix A=3D	Altitude Ref.	Altitude	Speed
1		hh:mm:ss	dd mm.mmm	N/S	ddd mm.mmm	E/W	V=2D	1013hP	GPS	kph
2										
3	B	180150	36º 28.350	N	118º 06.875	W	A	2736	2773	55
4	B	180156	36º 28.335	N	118º 06.835	W	A	2737	2775	44
5	B	180201	36º 28.322	N	118º 06.801	W	A	2731	2776	44
6	B	180206	36º 28.302	N	118º 06.771	W	A	2741	2777	40
7	B	180211	36º 28.273	N	118º 06.747	W	A	2737	2777	44
8	B	180216	36º 28.243	N	118º 06.722	W	A	2735	2778	42
9	B	180221	36º 28.217	N	118º 06.693	W	A	2733	2778	43
10	B	180226	36º 28.188	N	118º 06.667	W	A	2734	2779	45

7   Batteries and Charging

The 6040 operates on two banks of two AA batteries and comes equipped with four 2100 mAh NiMH batteries installed, for a total run time of approximately 30 hours. The instrument will always start on Bank 1 and will automatically switch to Bank 2 when Bank 1 is exhausted. When the 6040 is turned on, it performs a battery test during the start-up sequence and shows the approximate charge level of the two battery banks on the start-up screen. If battery Bank 1 is too weak for proper operation, the 6040 will automatically shut down. If this occurs, do not attempt to turn it on again until the batteries have been charged or replaced with fresh batteries. **Important: failure to observe this precaution can result in malfunction**. When the 6040 is shut down, the display will show the battery status of both banks on the shutdown screen. It is recommended that the rechargeable batteries in Bank 1 be swapped with Bank 2 once a year so that they age equally.

When the 6040 is on, the battery status of each bank is shown in the upper left corner of the display on the Main and Windlayer pages (Bank 1 on the top line and Bank 2 on the bottom line).

The 6040 has a built-in dual charging system that will simultaneously and independently charge Banks 1 and 2. When either the wall adapter or the vehicle charging cable is plugged in (under the right side port cover) the charging status LEDs on the bottom of the instrument will illuminate. The LEDs may blink for a few minutes when the charging cable is first plugged in while the charger assesses the condition of both battery banks. Each LED will turn off when its respective battery bank has been fully charged (4-6 hours if the batteries were nearly fully depleted). When the LEDs turn off, the batteries will continue to trickle charge and can be left this way to top-off the batteries. However, for safety reasons, it is recommended that the charger cable be disconnected after a few hours of trickle charging. **Note: If the charging is terminated before the LEDs turn off, the battery status will falsely show that the batteries are full.**

Bank 1   Bank 2

Charging LEDs

The ambient temperature should be between 50° and 86°F (10°–30°C) during charging. It may happen in warm ambient temperatures that the charging process will be discontinued – indicated by flashing LED(s) – because the batteries have gotten too hot. In this case the charging cable should be removed and replaced after the batteries have been allowed to cool down. **Important: The 6040 should not be switched on during charging, as this will interfere with proper charging of the batteries.**

If you forget to charge the batteries and discover at the take-off site that they are too weak to use, or if you are in a situation where recharging is not feasible, you can replace the rechargeable batteries with alkaline batteries. It is not necessary – but it is recommended – that Bank 2 have batteries installed. However, Bank 1 **must** have batteries installed. If alkaline batteries are used, the battery type should be changed to alkaline in *Menu>Instrument Setup>Battery type*. It is important

that the correct battery type be set, to prevent the 6040 from inadvertently switching off when it attempts to auto-switch from Bank 1 to 2.

Please recycle spent batteries.

8 Maintenance and Warranty

The 6040 is a premium-quality multi-function instrument equipped with sensitive sensors that preclude rough treatment of the instrument. Similarly, storage of the instrument in a humid environment is to be avoided. Cleaning of the housing should be limited to non-abrasive and non-solvent based cleaners used with a soft cloth. When not in use, the 6040 should be stored in the supplied carry bag; of course the bag must be kept clean and dry.

8.1 Resetting and Reinitializing

In the rare case where the 6040 becomes completely stuck (static display and no response to the keypad) you will have to reset the instrument. To do this, remove all four batteries for 1 hour.

Reinitializing the instrument returns the 6040 memory to the state in which it left the factory (i.e., all user settings, flight records, waypoints and routes are cleared). Occasionally the need may arise to completely clear the EEPROM memory, such as after a firmware upgrade or if the 6040 starts to behave unusually. To reinitialize the 6040 go to *Menu>Clear/Initialize memory>Initialize EEPROM*, press the *OK* key, change the *No* to *Yes*, and press *OK*. The Information Field will show the progress; wait for all sectors to clear before pressing any keys.

If a malfunction persists after resetting and/or reinitializing the instrument, reinstalling the firmware may be effective in resolving the issue (**please see section 6.4**). In the event that this too is unsuccessful, please return the instrument with a brief but complete statement about the problem to your dealer, directly to Flytec USA (within North America) or to Flytec AG (outside North America). When sending in an instrument for service, please include a service form from *http://flytec.com/Service.htm.* Do not send brackets, straps, bags, etc.

8.2 Exposure to Water

If water enters the 6040, damage is likely and the warranty is void. **Remove the batteries immediately to minimize the extent of the damage and prevent a destructive short-circuit.** The following steps should be performed as soon as reasonably possible:

- Carefully open the housing, being careful to not pull on any of battery leads or ribbon cables.
- Remove the keypad ribbon cables from the connectors on the circuit board.
- If salt water has entered the housing, rinse all affected areas with clean, fresh water.
- Dry the instrument carefully with warm air (e.g., a hair dryer, 140ºF max).
- Return the instrument to Flytec USA or Flytec AG for service.

Never place the instrument into a microwave oven!
Microwaves will destroy the instrument immediately!

8.3 Warranty

The 6040 is warranted against material and manufacturing defects for two years. Physical damage such as a broken housing or display window, as well as damage resulting from abuse, battery leakage, improper care, exposure to excessive heat or opening the housing is excluded from this warranty. In the event a defect is encountered during the two-year warranty period, please contact Flytec for service instructions. Please carefully read this operation manual before you contact Flytec for operation or service issues.

WARNING: In rare cases the 6040 may not provide any data at all, or the data provided may be incorrect. Flytec will not be held responsible for any claims resulting from missing or incorrect data. Flytec will not be held responsible for any damage claims arising from a malfunctioning unit. **Responsibility for ensuring the safe execution of flights lies with the pilot alone.**

9   Technical Specifications and Approvals

Altimeter:	Maximum 26,000 ft (8,000 m) in 3 ft (1 m) increments
Analog variometer:	+/-2,000 ft/min (+/-10 m/sec); in 20 ft/min (0.1m/sec) increments
Digital variometer:	+/-14,000 ft/min (+/-70m/sec); in 10 ft/min (0.1m/sec) increments
Speed (vane wheel):	Analog: 19–54 mph (30–90 km/h) in 1 mph increments
	Digital: 0–180 mph (0–300 km/h) in 1 mph increments
Waypoints:	200 WP
Routes:	20 routes with max 30 WPs in each
Maximum recording time:	145 hr @ 30 sec recording intervals, 97hr @ 20 sec, 48hr @ 10 sec
Track log points:	21,000
Number of flights:	100
Screen resolution:	320 x 240 pixels (1/4 VGA)
Operating temperature:	5° to 114°F (-15° to 50°C)
Flight recording:	According to the IGC format
Measurements:	6-3/4" x 3-3/8" x 1" (170 x 88 x 26 mm)
Weight:	12 oz (340 grams) without bracket
Electrical supply:	2 x 2AA NiMH batteries
Battery life:	±30 hrs
Charging:	12v at 1A (12VA) max

The technical details may be altered without notification.

9.1 Approval / Conformity

CE   The instrument was tested according to following Standards and is compliant.

ETSI EN 301 489-1 V1.6.1/ETSI EN 301 489-3 V1.4.1
IEC/EN 60950-1:2006: Safety Europe.

The instrument is to be charged exclusively with the charging unit Sincho SW12-120E 12V=1A, which is included in the original packaging.

FC The instrument was tested according to following Standards and is compliant.

47CFR15, ICES-003, Issue 4

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
   (1) This device may not cause harmful interference, and
   (2) This device must accept any interference received, including interference that may cause undesired operation.

10 Mounting Optional TT34 Temperature Transmitter

Approx 3 feet (1meter)

Circular
Top Opening
(Parachute)

The temperature transmitter must be mounted
approximately 3 feet underneath the top opening
(parachute) outside of the envelope

Position for mountingTT34

Temperature sensor

Temperature sensor cable

Velcro strap for mounting temperature sen
on the inside of the envelope

TT34

Envelope
Vertical loadstrap of envelope
Velcro strap (loop side)
Velcro strap (hook side)

Approx 4 - 6 inches

IMPORTANT

The upper velcro strap (hook side) must NOT
be pulled over theTT34 housing and should
be routed through the two mounting rolls on
the bottom of the transmitter housing (as shown)
This is to provide an additional thermal barrier
for the TT34.

Velcro strap (hook side)

Temperature sensor